JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

The Excuse of Anonymity.

THE meeting of the Alliance and Dublin Consumers' Gas Company was held on Monday last week; and, in view of the criticism of the affairs of the concern that has appeared in our "Correspondence" columns of late, a special report of the proceedings at the meeting is given by us to-day. There are one or two points about these proceedings to which we wish to make reference, as bearing upon the criticism that has been published, and deliberately published, with the view of ultimately benefiting the concern and the proprietors generally. In the first place, we may congratulate the Company upon the improvement in the working results of the half year compared with antecedent results. But we cannot congratulate the Chairman of the Company (Alderman W. F. Cotton, M.P.) and one or two of the proprietors on the manner of their dealing with the letters that have appeared in our columns. "Any excuse," is proverbially said to be "better than none;" and so thought the Board and certain also of the proprietors friendly to the directorate. But, in this instance, those who are disinterested, and who have read the impeachment contained in the letters in question, will say that the excuse put forward for not dealing with the whole of the criticism (only one or two points were referred to) shows extreme pusillanimity.

The Chairman, as the mouthpiece of the Board, said they had decided that it was not in the interests of the proprietors to carry on a discussion in the "JOURNAL" with an "anony-" mous correspondent." Where is the strength of the Board that they cannot attack, or have not the courage to attack, a so-called anonymous correspondent? Is it, too, truly in the interests of the proprietors that such criticism should go unanswered? The longer the Directors take up such a feeble attitude of making the so-called anonymity of their critic the excuse for not fully and categorically replying to him, the longer will many proprietors, the public, and numerous men in the gas industry believe—whether rightly or wrongly it is not our present intention to discuss—that the Board are cognizant of the fact that the criticism is not so unwarranted as they would prefer people outside the Board-room to think. That is the position the Board have to face. And that position Alderman Cotton made all the worse by declaring that he had penetrated the disguise of "Nonulus," and "was " not without knowing the gentleman who had anonymously " signed the letter to which he had made allusion." If that be so, then Alderman Cotton is fully aware that the critic is competent to discuss the affairs of a gas undertaking; and that knowledge (if really possessed by Alderman Cotton) makes the excuse of anonymity all the more irrational, and the position of the Board the more untenable.

The strength displayed by the Board in resisting the efforts of their critic to draw them into a defence and an explanation regarding their administration and the results of that administration, is of a far superior order to the strength displayed by them in refusing to grapple with the criticism. We want, therefore, to say a few words on their excuse of anonymity, which excuse was at the meeting supported by a Mr. R. H. Davis. This gentleman "questioned if, after all, it " was worth while taking so much notice of an anonymous " critic. Did not business men agree in putting anonymous " epistles into the waste-paper basket?" Can it be said that the critic is an anonymous one, so far as the Board are concerned, if the boast of the Chairman is true that he has knowledge as to who the critic is? But irrespective of any real foundation for that boast, there is a very clear distinction to be drawn between an anonymous personal communication and a communication addressed to a paper of the standing of the "JOURNAL," and published under a *nom de plume*. No letter—let the Board and all interested in this matter understand this—is published in our columns under a *nom de plume* the writer of which does not comply with the editorial rule that no communication can be published not authenticated by the name and address of the correspondent. The fact of publication shows that the Editor is satisfied as to the *bona fides* of his correspondent; and the Editor guarantees those *bona fides* by permitting publication, though not holding himself responsible, or a party to, the statements made in the communication. The distinction between anonymous personal communications and letters published in our columns under a pen name are thus markedly defined. The Editor's knowledge and guarantee place communications of the latter kind in an altogether different category from the former, and therefore rob the excuse of the Chairman and Board of the Company of all substance. The more their position and the excuse are considered, the weaker the two become; and no one knows this better than the members of the Board.

We will not discuss the Chairman's statement, so far as it had relation to the criticism, beyond making these two points: He alluded to the Company's Act of 1909. All we need say about that Act is that the character of the settlement that was effected to get the measure through Parliament was as severe a criticism of a concern as it has ever been our lot to encounter in a long parliamentary experience. The second point is as to the comparison of the number of consumers per mile of main between London, Suburban London, and Dublin. The comparison was referred to in the course of the meeting as a "ridiculous" one. The Chairman boasted that the number of consumers per mile of main had since 1909 "considerably increased." He did not interpret by any exact figures what he meant by the term "considerably." However, as the number has "con-"siderably increased" since 1909, then the figure reached by the administrative policy up to the year 1909 probably deserves the opprobrium of the word "ridiculous" even more than the comparison made by the critic of the Company's directorial policy. The critic, "Nonulus," has promised something for our "Correspondence" Columns next week on the proceedings at the meeting.

Expansion of Publicity Work.

UNDER the natural laws of evolution, development takes time, and development begets development. The report of the General Committee of the British Commercial Gas Association (signed by the President, Mr. Corbet Woodall, and the Chairman of the Committee, Mr. F. W. Goodenough) which is being presented at the meeting in Manchester to-day, shows that experience has brought to the knowledge of the Committee much additional work that could usefully come within the purview of the Association if more undertakings would join the ranks, and so strengthen the sources of finance. There is no occasion to restrict the functions of the organization to advertising and the preparation of literature, and pictorial material for advertisements. There are other "claims" waiting to be opened up, and value to be won from them. The permanence of commerce requires a foundation composed of more than one factor. The proof of value is of importance; and so is the proof of the enhancement of value. These are days when there is not a member of the younger generation who has not greater opportunities for being better educated than his or her forbears. If he or she is not better educated, it is his or her own fault. Anyway education has become more diffused; and the collective human mind has a stronger desire for knowing the why and the wherefore of things.

This being so, the General Committee recognize that there is much scientific research that could be profitably undertaken under the auspices of the Association. That would be, if funds permitted, a very natural development from the development that has already been made. And there is a further one, in the assistance that could be rendered to the educational, sanitary, medical, and architectural professions in the study and application of the principles of hygiene and economical lighting and heating. All such work—and it is all fundamental work—can only be done through co-operative

agency. But the Committee cannot commence work in new channels unless they have the necessary means. At the present time, they have included in the membership 25 municipal undertakings and 226 company undertakings, with the substantial co-operation of the Society of British Gas Industries. The revenue is £13,500. What has been done so far shows that activity has only a single limitation, and that the financial one. If more gas undertakings would join (they are doing so, but the pace is leisurely), the scope of the Association would be still greater. The number and position of the municipal undertakings that have become members ought to settle the doubts of the committees of other local authority gas concerns. The report is a message not only to the members of the organization, but to all directing the affairs of gas undertakings who are non-subscribers. The work of the Committee needs no commendation here The community at one time regarded the gas industry as something from which only stereotyped service was possible. The community have of late years had occasion to alter their view; and more so during the comparatively brief time that the British Commercial Gas Association have been in active existence.

Organization and Mutuality of Interest.

PREGNANT as it is with thought, and charged with wise epigrammatic statement, we commend to consideration the address that Mr. Charles H. Armstrong, the Secretary of the Walker and Wallsend Union Gas Company, delivered last Saturday from the Presidential Chair of the North of England Gas Managers' Association. The address stands out with a distinction of its own, for the contained accumulated philosophic utterance on the matters dealt with. In itself, it is one of the strongest indictments we have yet heard or read of the exclusiveness of rank and position in connection with the gas industry. Mr. Armstrong took his opportunity; and his words are obviously addressed not to the restricted circle of any one organization, but to the gas industry generally. The whole deliverance—the fruit of broad-minded consideration and observation—is a plea for tolerance between all who have administrative and executive work in the gas industry, for co-operative agency, and for the bringing together in collaboration in the interests of the gas industry the existing diffused talent and ability in the common cause of progress. These conditions the "urgency " and spirit of the age" demand; and it is quite true that industries, whatever may be their nature, flourish best the greater the sum-total of the constructive intelligence that is brought to bear upon their diverse and complex affairs. The essentials to progress and protection of an industry of the characteristics of those of the gas industry are not of any single order. Every department of the work of the latter overlaps, and all departments have interdependence. And, therefore, the greater the mutuality of the effort of specialized intelligence and judgment, the greater and the broader must be the material effects. There is little use in attempting to assail impregnable truths. We have to accept them, or make ourselves look foolish and weak in the attempt to alter their complexion, while the truths remain as concrete as ever. Not one of us would say other than that he desires to do the best possible for the industry; but if this is to be done, there is the need to get away from that much-cherished and self-conscious superiority that has taken root in some quarters of the industrial official structure, and accept the broader view of an ability in all sections of the official life of the industry—through organization, conference, and concerted action—to subscribe to the best means to the universally desired end of the largest possible measure of stability and progress.

Briefly and generally put, this is the main lesson to be derived from the part of the address of Mr. Armstrong that has the greatest attraction for us, and which part shows no hastily conceived wording, but is the expression of mature thought. He led up to the point in a few words of regret that there is no recognized hall-mark of merit for the individual in the gas industry. Yet the strength and position of the industry, he holds, warrant some tangible distinction without having to look to other institutions for it. The charge is true; and yet we are not disposed to make overmuch of it. A new day has dawned in the gas industry. There are many defects in its organization, in its administration, and in other respects. If our means of progress are disjointed, and have no definite and well-ordered mutuality, this much we can claim, that the end in view is a common one (which could be served better than it is at present), and that the industry itself is adopting, or rather it has largely adopted, wider views as to the conferring of tangible hall-marks of merit by the selection now made of men for the best positions in its executive work. We are not over-possessed in favour of distinctions conferred by examination, but we do place a high valuation upon the distinctions of place obtained by the proofs of work done. Influence and nepotism still in some measure control such distinctions; but not to the extent that formerly obtained. Among the industry's administrations is seen the recognition that the protection and advancement of interests lie not in personal likes and dislikes, but in the selection and realization of the best talent. The more this spirit and action are inculcated by the stress and competition of the times, the better for the whole industry, and official position will become more and more the hall-mark of merit.

We have the President putting two pertinent questions. Is the industry progressing as it ought to do; and is it showing sufficient prosperity as indicated by results? The questions, as we say, are pertinent ones; but they are not directly answered by the President. We are left by the accompanying argument and commendation as to what is desirable in prosecuting ends to inferentially conclude that the President's reply—good as has been progress, good as is prosperity—would be in the negative. It is impossible, in short, to get the ultimate profit from the working efficiency of any mechanism that is impaired by loose and ineffective conjunction of parts. So we come to, and can subscribe to (for it is in line with our own insistent argument of recent years), Mr. Armstrong's belief that the greatest measure of success in any industry must accrue from the complete organization and co-operation of all its parts. We are strong believers in individuality. We believe in the faculties of investigation, initiation, and invention being exercised here, there, and everywhere; but we also believe in bringing them into touch and into active communion in order to promote benefit. Just as this has a beneficial effect, so the organized means that promote progress and success are advanced and are endowed with a greater utility, by the broadness of membership, and by the volume of detail, opinion, and judgment that is produced of the practical observers in every department. The object of every industrial organization—if it claims the title of "industrial," and not the narrow one of "professional"—is universal progress; and unless there is universal progress, the organization is not fulfilling its fundamental purpose. Therefore, it is clear that the view of Mr. Armstrong (whose views on this subject we should have been sorry to have missed) is that progress and prosperity in the gas industry do not show the sufficiency that should be acquired by having in the industry the nearest perfection that can be humanly attained to a representative organization with the highest standard of universal usefulness before it as its ideal.

In our central organization as at present constituted, there is rebellion against certain of the canons of belief that, with much aptness and sincerity, we apply to other things. We speak of the indispensability of science to practice, and of practice to science, in serving the best of material and economic ends. We speak, too, of the necessity on the boards or committees governing and directing our enterprises of a variety of talent—technical, commercial, and financial. Yet in our central organization, we scout the principles that we deem necessary in other walks of life. In the British Commercial Gas Association (which is meeting to-day for the first time for what we hope is the inauguration of a long succession of annual conferences), we have the nearest approach yet attempted to the embodiment of the principles which we have so freely accepted in other connections, and to their application to our industrial needs. In the ranks of that Association, technical, commercial, administrative, and financial ability are brought together for the furtherance of industrial ends by mutual effort. It is far more representative as an industrial organization to-day than is the professional Institution; and the day may come when its industrial work will be extended. "Commercial knowledge," says Mr. Armstrong, in his sententious address, "may be considered the "keystone of technical progress." This statement could be twisted about, and other expression could be incorporated in it. But the meaning is abundantly clear; and there is no need to quarrel with the statement as it stands. But technical progress and commercial progress have such reciprocal reliance that we would give to the two an equality of rank. There being this equality in fact, we ought to do all we

can to establish our organizations so that both are encouraged and nurtured collaterally, and under the most effective auspices. We want the best men in our technical, secretarial, and commercial offices, and we want to spread among them the idea of oneness in ambition and object, and the sensibility of mutual responsibility. The requirements of the times are plain. The industry must, by the best combination of effort, give the public the highest value for money, and must gain the confidence of the public to the highest attainable measure by the proof of merit. These aims are essential in these competitive days; and they are essential to the material ends to which enterprise has a legitimate right to look. This being so, there can be no reluctance, but every desire, to subscribe to the broad-minded principles underlying Mr. Armstrong's address, and to the object he had in advancing the claims of an industrial mutuality, as opposed to sectional and exclusive effort on entirely independent lines.

The address might almost be divided into two parts—the one upon which we have been drawn into comment, and a second part which gives illustration of the lines where the work of the secretary of an industrial concern such as a gas undertaking who knows that the technical side of his business (the side which goes beyond mere clerical and book-keeping routine) has interconnection with the work of the engineer. We see this in the sections of the address treating of depreciation and income-tax and poor rate assessments. The points made by Mr. Armstrong on both subjects invite discussion. It has been generally recognized that, while good results have issued in regard to the former matter from the recent negotiations, and while composure of differences in respect of principle and allowances has been effected up to a certain point (which is something gained), finality has not been attained in regard to all questions arising from the subject of depreciation. Concerning poor rate assessment, the President gives fresh illustration of the necessity for the establishment of some definite and fixed bases of equality of computation; and he points out, with full conviction, that the longer the gas industry allows this matter to drift, the more difficult will become a reasonable solution. We all know well the anomalies of parliamentary legislation, which are also illustrated in the address. The tribute to the beneficent ends served by co-partnership brought to a finish an address which stands out among such compositions with a distinction of its own for the quality of thought on the subjects dealt with, and for the manner of its presentment.

Chemical Composition of Air and Ventilation.

Most of the largest buyers of gas-fires have laboratories of their own; and, in these days, there are not a few of them who are gradually incorporating in their testing equipments the means of carrying out necessary efficiency trials of gas-fires upon their own account. This is a good thing. The gas-fire maker who recognizes that the most efficient product he can put on the market is the most salutary for the expansion of the domestic gas-heating business, while inefficient appliances are a drag on business expansion, welcomes the buyers' tests, as he appreciates that this is not only good for his own industry, but that it will assist in weeding out inefficient makes, and will, by the circulation of information in the industry, conduce to work being pursued with a high-standard ideal in front, and to the maintenance of a high standard. There is the further consideration that, with growth of the practice of testing by buyers for radiant heat, flue gas temperatures, and products of combustion, efficiency, as well as cost and appearance, will be a factor in determining purchase. Mr. F. L. MacLaren, of Dumbarton, had a good deal to say on the question of gas heating, in the Presidential Address he delivered last Saturday to the Western Division of the Scottish Junior Association. This was, in fact, the principal theme of the address; and the subject is an opportune one. The address was informative; but there is nothing much in it that can be criticized. In fact, there is not any considerable part in it that is really new; but it brings together several matters connected with the general subject that will raise interest among those working in the sales departments of gas undertakings.

One thing is the point already touched upon, as to the availability to-day of the appliances for conducting tests. Mr. MacLaren also discriminates in his remarks between domestic heating and factory heating; and it would be a good thing if many other people who talk on these subjects —sometimes idly and ignorantly—would do the same, and would also consider the distinctive conditions obtaining, the difference of the requirements, and the relative activity of the people occupying rooms at home and workrooms in factories. If this were done, there would not be so much nonsense heard about the subject of the use of flueless radiators in large-spaced interiors, but more would be heard about the need for adequate ventilation, which, if adequate for the workpeople, would be adequate for the use of radiators. Knowledge is spreading as to the fact that the chemical composition of the atmosphere that we breathe is not, within very wide limits, the matter of greatest importance. Mr. MacLaren modestly made a point of this in his address. He said: "It has been proved that at any rate up "to 225 parts of carbon dioxide per 10,000 has no effect on "the human organism, and probably it is not the presence "of carbon dioxide, but the absence of oxygen, which causes "ill-effects when the percentage is above this."

Mr. MacLaren might with ease have gone higher, in his reference to proof, than a 2·25 per cent. proportion of carbon dioxide being without any deleterious effect on the human system. So considerably larger is the percentage (as these things go) compared with the prescription based upon bureaucratic fallacy, that it would be just as well if the authorities ended their attitude of representing by an absurd restriction carbon dioxide as a terrible impurity, and test the atmosphere for other health-giving essentials. Research, too, shows us that we can go down several points in the percentage of oxygen without impairing the action and vitality of the human system. What is really wanted for health is a fair amount of movement and a fair degree of humidity in the atmosphere; and, given these conditions, the chemical composition of the atmosphere will be found to be about right. It really comes to this, that chemical composition of the air need only be an index to factory inspectors as to the sufficiency or otherwise of the ventilation. There is, moreover, the fact, which can be proved by many demonstrations, that, in properly ventilated workrooms, wards in hospitals, and other places, the volume of carbon dioxide in the atmosphere with radiators in use is sometimes found to be less than in the same apartment without radiators in use. In this we see how natural laws prevail; how the higher temperature promotes circulation, emission, and replacement of air. When this fact becomes well-digested by the department with supervision over our factories and workrooms, as well as certain of the fruits of chemical investigation, then the authorities will, we hope, do the rational thing by compelling proper ventilation provision, and not offering resistance to the use of heating appliances that are proved, given efficient ventilation, to contribute to, rather than detract from, hygienic conditions.

There is only one other point. No one need alarm himself over the abolition of the sulphur restrictions. Necessity and protection of interests are doing more than parliamentary enactment in keeping gas undertakings within bounds, and, in fact, the abolition and the effects have stimulated purification investigation, which has carried us some distance along the road to fresh practices. If there are any undertakings that are not exercising care in this direction, the results will be their own burden, and no one will sympathize with them. On the whole, it may be taken that gas undertakings are showing due discretion in this matter.

Municipal Competition with Private Enterprise.

A past Lord Mayor of London, a long record of public work in connection with the City Corporation, and a commercial experience of a large order in the City, sum up as succinctly as possible the chief of the public sides of the career of Sir William Treloar. But his attachment to municipal life notwithstanding, he has contributed an antagonistic article to the "Daily Telegraph" on "Municipal Trading: The Effect of Competition." The competition of privately capitalized motor-busses and tube railways in London with County Council owned tramways is making the latter feel financially shaky; and the cry of the so-called "Progressive" is "Tax the motor-bus in order that the municipal-owned tram may live." Sir William takes this as the ground upon which to show his contempt for municipal trading of all kinds, and especially for municipal trading that can only obtain support for life by either working at unremunerative prices or putting obstacles in the path of the private trader that would not be put there if it was a case of private enterprise against private enterprise. The greatest

ambition of the *pseudo*-protectors of the local interests of the people is to make the price of the rival commodity or service as high as possible, in order that they may stamp out the competition of private enterprise. It is quite impossible for these municipally managed concerns to fairly and squarely meet competition. If Sir William had been dealing with municipal electricity instead of municipal tramways, he would have found a great deal that would have been worth getting into the columns of the "Daily Telegraph" regarding the pernicious ways of the municipal trader in opposing private enterprise. He would also have found that there are a certain number of feeble-minded persons in the electricity industry who think that if municipal management of electricity supply could effectually strangle the gas industry so much the better. The tale of the variegated unfairness that the privately directed section of the gas industry has to contend with at the hands of the municipal traders would make an amazing tale for the ears of an old and honoured commercial man (whose position is entirely due to private enterprise) such as Sir William Treloar. From his article we see that in six years no less than £400,000 of the ratepayers' money has been expended by municipal authorities in opposing in Parliament the projects of private adventurers—that is to say, of ratepayers.

A Coal Mine Nationalization Bill.

The Miners' Federation of Great Britain, who held their twenty-third annual conference in Swansea last week, have gone a step farther than do the delegates at the majority of gatherings of a similar character. The chair was occupied by the Vice-President, Mr. Robert Smillie, who, in the course of an opening speech, expressed the opinion that the time had arrived when the mining industry should be in the hands of the Government, and worked by them on behalf of the whole nation. He has come to the conclusion that whoever has suffered as the result of the late general strike, certainly the coalowners did not do so. In fact, he is inclined to think that financially they are considerably better off than they would have been but for the strike. It has, he added, been shown that the mining industry is of far too great importance to be left any longer in the hands of private individuals "whose chief, if not entire, interest is to make profits and make fortunes." This consideration had driven the Federation to bring forward a Bill for the nationalization of the mines, which had been prepared by their Executive. Of course, this subject did not monopolize the time of the meeting. Later one or two matters arising out of the Workmen's Compensation Act came before the conference. A proposal was agreed to for the amendment of the Act, so that when a workman is suffering from a scheduled industrial disease, contracted in the course of his employment, and procures a certificate to this effect from a certifying surgeon under the Factory Acts, his employer shall be bound to pay him compensation without legal proceedings being necessary to establish the fact that the workman is suffering from such industrial disease. A resolution was also carried making the State responsible for the payment of compensation—the amount to be recovered from the employers. The proposal further provided that, in the event of the employers or an insurance company going into bankruptcy, such payment should be the first charge on the estate; and if the estate did not yield the amount required, the balance should be paid by the State. This far-reaching suggestion was, like the one already named, agreed to unanimously. A similar reception was accorded to a motion urging the Federation to endeavour to secure for miners whose age or infirmity debarred them from work under the Minimum Wage Act a State insurance, by means of a special tax on profits derived from the coal-mining industry.

Main Features of the Measure.

From the public point of view, however, the most interesting item in the conference was without doubt the measure drafted by the Executive, entitled "A Bill to Nationalize the Coal Mines and Minerals of the United Kingdom, and to Provide for the National Distribution of Coal." Whether or not more is to be heard of this proposal in the future, the main points of the nineteen clauses are worth noting. In a preliminary clause, the appointment of a Minister of Mines, at a salary of £2000 a year, is provided for. To assess the purchase price of the mines, it is proposed that ten Commissioners shall be appointed—the Chairman to be nominated by the King. The other Commissioners will be selected by the Mining Association of Great Britain, the Miners' Federation of Great Britain, and the Trade Union Congress. The purchase price is to be computed on the basis of the average annual number of tons of coal actually raised during the five preceding years; but in no case shall the maximum purchase price be taken to be more than 12s. per ton when 100,000 tons or less have been raised per annum on the average during the five years, or 10s. per ton when the average amount has been more than 100,000 tons a year. Various other matters are set forth which the Commissioners are to take into account in making the computation. The purchase price is to be paid by the Minister of Mines by means of the issue of guaranteed 3 per cent. Coal Mine Stock, the dividends on which are to be paid out of the income of the Coal Mines Fund, or, failing that, out of the Consolidated Fund of the United Kingdom. The working of coal mines by the Minister of Mines, and the keeping of accounts, are provided for; and one clause states that it shall be the duty of the Minister to ensure that there is a sufficient supply of coal at reasonable prices throughout the United Kingdom; and for this purpose, he is to establish stores and depôts, and to employ vehicles and use all other necessary means for the selling of coal within the area of every local authority. It is to be unlawful for any person or body, corporate or incorporate, to establish or maintain coal-stores or depôts for the purpose of sale, or to sell or facilitate the sale of coal; and every person so establishing stores or depôts or selling or facilitating the sale of coal shall be liable, on summary conviction, to a fine not exceeding £20 for every ton of coal so stored or sold or attempted to be sold. The passing of this Mines Nationalization Bill would be a serious thing for many people.

PERSONAL.

Mr. JOHN A. RANSOME, Managing-Director of the Richmond Gas Stove and Meter Company, Limited, has been appointed a Justice of the Peace for the county of Chester.

The West Bromwich Town Council have confirmed the appointment of Mr. FRANK E. COX as Assistant Gas Engineer, in succession to Mr. A. O. Jones, who has gone to Manilla.

Mr. ALFRED BEVIS last Monday retired from his position with the Gaslight and Coke Company after a service of forty-four years, for twenty of which he was Accountant. He is succeeded by Mr. W. BLAKEY, who has held an appointment in the Accountant's office for the last twenty years.

At a meeting of the Directors of the Baslow Gas Company, Limited, on Monday last week, a resolution was passed expressing sincere appreciation of the faithful services rendered by Mr. J. R. MATTHEWMAN, who has recently resigned the position of Secretary to the Company—an office he has held since 1879. Subsequently, Mr. ROBERT HALL, Secretary of the Matlock and District Gas Company, was appointed as Mr. Matthewman's successor.

The medal of the Society of Chemical Industry, which was founded in 1896 for the recognition of "conspicuous service rendered to applied chemistry by research, discovery, invention, or improvements in processes," has this year been awarded to Sir WILLIAM CROOKES, O.M., F.R.S., "for his epoch-making discoveries in physical chemistry and the rare metals." Owing to the distinguished scientist's advanced age, he could not attend the recent annual meeting of the Society in New York to receive the medal; and it is to be presented to him at an informal dinner to be held in London on the 23rd inst., under the chairmanship of Dr. Rudolph Messel, F.R.S., the immediate Past-President. In the course of the proceedings at the meeting, Dr. Messel gave a sketch of Sir William's career, and incidentally referred to the fact that he was for many years one of the chemists who, on behalf of the London Water Companies, reported monthly as to the quality of the water supplied to the Metropolis. An excellent portrait of the distinguished Medallist, with his autograph, accompanies the number of the Society's "Journal" for the 30th ult., which contains a report of the meeting.

It was stated in last week's "JOURNAL" that the Glasgow Corporation had decided to recommend the Corporation to appoint Mr. RALPH HALKETT, of Leeds, to the new post of Commercial Superintendent, at a salary of £500 a year. Last Thursday this recommendation was adopted by the Town Council; and on the following day the "Yorkshire Post" published a portrait of Mr. Halkett, with a notice of his career, and congratulated him that he has "succeeded to a position generally regarded as one of the 'plums' of the profession." Our contemporary adds: "Mr. Halkett, who is extremely popular with his colleagues, is only 36. Educated at Bedford, he underwent a course of study at Edinburgh; and his father, for many years a lessee of gas-works, directed his son's training. In 1903, Mr. Halkett received an appointment at Bournemouth, and four years ago came to Leeds, where he has assisted in superintending the installation of the high-pressure gas system—the latest achievement being the replacing of the electricity supply of the City Markets by eighty high-pressure gas-lamps. He has done pioneer service in the commercial side with complete success. Mr. Halkett is the author of 'Practical Advice on Gas-Fitting,' and has written several articles for trade journals."

THE BRITISH COMMERCIAL GAS ASSOCIATION.

FIRST ANNUAL CONFERENCE—MANCHESTER, OCTOBER 8 and 9, 1912.

PRESIDENTIAL ADDRESS DELIVERED

By CORBET WOODALL, Esq., M.Inst.C.E., D.Sc.

I find it difficult to express, in adequate terms, the gratification I experience on the present occasion. I am proud of my position as the first President of this Association, called upon to open its first general meeting and conference under influences so remarkably favourable.

Our constitution states that we are incorporated under the auspices of the Institution of Gas Engineers, which may be said to be a certificate of character. It is less of this testimony of origin I am now thinking, however, than of the endorsement of our aims and programme by no less responsible and influential adherents than the Gas Committees of the Corporations of Manchester and Salford, who stand for so much in the polity of our great national industry.

It is well for us to be here starting a public career, which we trust will prove a useful one to the community at large, with the God-speeds of powerful civic authorities who know, by intimate experience, how necessary gas is to the life and prosperity of important industrial centres. To borrow a familiar aphorism often heard from other platforms, we hope and intend that in this respect, "What Lancashire thinks to-day, England will think to-morrow."

The Institution of Gas Engineers was itself a native of these strenuous parts, where men do not waste their time upon the formation of superfluous societies; and we are happy in being able to return to our Mother Earth, and, like the giant of ancient myth, renew our strength by such contact. It is not every scion of an old stock that receives such a welcome as has been extended to us—partly no doubt for the sake of our honourable pedigree, but chiefly, we may flatter ourselves, for our own merits.

We are fortunate, too, in our period. This has been a year of noteworthy Centenary Celebrations. Prominent among these functions has been the Centenary of the Gaslight and Coke Company, the first in order of the gas companies of the world. It is indeed five years more since the earliest great success of gas lighting was achieved by William Murdoch at the cotton mill of Messrs. Phillips and Lee of this city; but gas supply as a service dates from the incorporation by Royal Charter of the Gaslight and Coke Company, of London.

It is a long flight of time to look back upon, but what I take most pleasure in observing in this connection is the still exuberant vitality and power of growth of our ancient industry. It may be claimed for it as for a centenarian patriarch of old time that its natural force is not abated.

Centenaries are graceful exercises, and worthy of being honoured in a proper spirit; but the putting forth of new growth is a sign of life which also deserves to be greeted with thankfulness. It has been said that the keeping of jubilees and centenaries is a taste significant of those who are themselves growing old. But this is only partly true. It would ill-become me to doubt the wisdom of the ancients, who have praised certain old things as being better than the new. Yet I had rather look ahead than behind.

This is the very latest of Gas Associations; and I decline to consider myself out of place at its head. For what I see in our society is a promise and gage of a better, fuller day for the world, not less than for the gas industry. I confess that when I first consented to accept the honour you proposed to confer upon me, and take the chair at this gathering, I did not regard this Association in the light in which I now see it. This means that I have been thinking much about it since; and I find in it a means of greatly widening and extending our usefulness to the community—not merely increasing our business and income.

What I hope I distinguish in our Association, also, is the dawn of a fuller conviction of the unity of interest which unquestionably underlies the diversities and severances of particular gas undertakings. I offer no apology for taking my view of this prospect very seriously; and I rejoice to see around me so comprehensive and representative a body of gas men brought together for a common purpose which all can follow without any risk of clashing of personal or other interests. This is good to see. The Institution of Gas Engineers once tried to achieve the same unity of membership, but in vain, for the simple reason that community of purpose was lacking. We have the needful bond of union; and I can see no bounds to its useful and beneficent influence. Our industry has suffered from its divisions. Neighbouring undertakings, and groups of undertakings in different regions, have imagined themselves antagonists; and especially have gas companies and municipal gas committees regarded one another askance. I do not say that there are no divergencies of particular interests anywhere; but I do maintain that the interests in which all British gas undertakings share are more and more considerable than those which divide them temporarily or permanently. It is these that are worth cultivating, and that I not only believe to be capable of cultivation, but to be so by this Association as it now stands, and even more as it will be if our faith in the future holds out.

In particular, I want to see the death of the old jealousy, the old selfishness which says: "Oh! let the other folks do it if they like. They can afford it; and if they win we shall get some of the benefit." How many gas undertakings have been run on these lines, in which there is, in my opinion, little wisdom and less profit. We are the heralds of a new birth in gas polity. We stand for unity in rendering our services to the community; and we know that what is best for one is good for all, be they shareholders in gas companies, ratepayers, engineers, manufacturers of, or contractors for, our supplies, or the workmen upon whose fidelity our safety and welfare so largely depend. It is in the cultivation of the multifarious utilities of gas that the reaction of greater prosperity will be experienced by every branch of the industry.

There must be, of course, the use of fresh means to secure our ends. Prominent among these is co-operative advertising. We must understand that the selling of gas is our first care. You know the Horatian monition, "Make money, my son—honestly, if possible; but make money!" Our task is not quite so exacting; yet we desire to sell gas—not merely my gas, or your gas, but everybody's gas. For this reason, we do not care a jot whether our advertisements find their mark here, there, or elsewhere. Nothing less than our Association could subserve this purpose. Thus our organization became inevitable; there being an interest in question embracing nearly 2000 gas undertakings without inter-competition. Proceeding upon the assumption that the sale of gas is the immediate object of the existence of all these independent businesses, within the Association will be found the best possible aids to the attainment of this object. In our case, however, there are ulterior aims to be pursued. We also desire that our customers for gas shall obtain the best possible value out of their purchases. It is, therefore, desirable that the service side and aspect of our business should be so organized as to ensure that, in every detail of the relationship of buyer and seller, not merely the convenience but the best interest of the former shall be studied by the latter.

This implies the best obtainable commercial organization on our part. We shall compare notes upon and discuss these matters—much as those of us who come into the business by the works' door have been in the habit of debating questions of carbonizing economy or naphthalene prevention. In addition, we must employ every possible means for ascertaining the needs of every class of actual or potential user, so as to fit the service rendered or offered to the circumstances of every consumer. Nothing has distressed me more in my work—especially abroad—than to note the flagrant neglect by English manufacturers of this palpable condition of success.

As I place the general subject of the serviceability of this Association before my mind, therefore, I see at least three sides to it. There are probably many more; but these three will do to begin with. They are: Publicity; Sales Organization; Service Development. They stand in the

same order for receiving attention. I think the special work already performed by the Association Executive, in regard to the publication of the "Bulletin," and the preparation of so many ably-written articles and well-designed and illustrated advertisements is deserving of the most cordial recognition at the hands of this assembly. It is part of the ordinary working conditions of journalism, that the author and the artist labour in the dark and seldom or never receive overt acknowledgment of whatever merit they may display. Therefore, I am particularly pleased to have the opportunity of complimenting our accomplished Editor, Mrs. M. A. Cloudesley Brereton, upon the uniform excellence of her work; and I think a measure of approbation has also been earned by the illustrator. Indeed, I consider the Association remarkably fortunate in the officers and the agents whom it has found for its initial efforts to attract the notice of newspaper readers, the planning of which must have been a task calling for as much tact as knowledge of the class of work required.

The principles of judicious advertisement are by no means obvious. I do not blame those old-fashioned people who entertain a dislike of advertising in any shape or form. Nevertheless, I am persuaded that, within proper and reasonable limits, suitable trade advertisements are strictly economical factors in the conduct of a business. I noticed the other day that "The Times," in the course of the huge special supplement (in itself a big advertisement of the journal) with which it celebrated its 40,000th issue, discussed the economics of trade advertisement in an article containing the following passage:—

> "The elements in the value of advertising are two, of which one lies in the reader himself or the onlooker, whichever he may be, the other is embedded in the conditions of modern industry. The stress and hurry of modern life, the increasing calls on his time, and the appeals of his various pleasures are daily raising the price of the attention of the ordinary individual. It is, moreover, not only the mere pressure on his mind of his amusements and his occupation which have increased the difficulty of approaching him; but the man in the street has lost his receptivity, he is warily on guard against his own impressions, and he has schooled himself to petty harshnesses and frugalities. Yet the silent struggle goes on. Sooner or later he must spend his money, and generally in the direction of those who have wooed him most skilfully, and, perhaps, most expensively. In the price which he ultimately pays for his goods or his enjoyments is presented, among other constituent costs and profits, also the little bill for advertising. So it is the public that pays for all in the end as we might expect."

This sounds like reason; yet closer examination reveals the fact that, like very many other "common sense" interpretations of social phenomena, it conveys a fallacy. This was exposed a few days later by a writer better versed in the subject, who pointed out that:

> "The result of advertising in the majority of cases is enormously to increase the output of specific articles, and the decreased cost of manufacture is far greater than the cost of achieving a large sale such as is only possible through the aid of advertising. In the majority of businesses many of the charges for conducting them remain fixed. The cost of every article sold obviously bears a proportion of these charges; but as through advertising the output is enormously increased, the proportion of fixed expenses is spread over a much larger quantity, and the result is a decreased rather than an increased price."

This statement appears to me to be conclusive. It is no reproach to advertisement that it merely tells people what they already know, or ought to know. The same reflection might with equal justice be passed upon most preaching and upon platform oratory in general. Even advocacy at the bar of justice would not be exempt from similar criticism. Yet the world will have these exercises; and for the same reason it must have advertising.

This, therefore, is the case for that part of the Association's work which I have classified as "Publicity." It is this which concerns itself with the first of essentials to successful salesmanship, and which we find from experience needs advocacy before it receives universal support.

In the case of some undertakings, it is necessary first of all to persuade the administrators that any expenditure upon publicity is necessary. Their enterprises have paid dividends or contributed to the relief of the rates in the past without any money having been spent on publicity. Why is any such expenditure called for now?

My answer to that question is this: Parliament has given your undertaking a monopoly-right to supply gas in your district. Whether you are a sliding-scale company, or a maximum-dividend company, or a municipal undertaking, the public rights you possess impose upon you a public duty—that of supplying gas in your district at the lowest possible price consonant with your other obligations. You can only supply gas at the lowest price possible in your district by selling as much in that district as can be advantageously used by everyone living or doing business in the district. You can only sell the possible maximum quantity of gas in your district by "making known as widely as possible the truth concerning all the possible uses and advantages of the commodity and the reasons why it will be to the advantage, both ultimate and immediate, of the public to purchase the commodity"—*i.e.*, by spending money on publicity.

This argument also has to be met: "Why should we not spend all that we can afford to spend on our own local publicity work?" The answer to that argument—a conclusive answer it appears to me—is this: You can "afford" to spend and ought to spend on local publicity work every penny that will produce a profitable return—neither less nor more.

The Association can help you to do all the local work that requires to be done far more economically than you can do it without the aid of co-operation. This has been clearly demonstrated already by the experience of many of the subscribing undertakings; and it is a cogent argument in favour of every undertaking becoming a subscriber. It is not a question of alternatives but of complements. National publicity is complementary to local publicity, and local to national. Neither is complete without the other; each increases the value of the other.

It is obviously useless to advertise your wares unless you are adequately equipped for dealing properly with every business proposal as it comes. This means internal organization upon enlightened principles. And in this connection I would take the opportunity of referring to the concluding, but by no means least important, item on the *agenda* of this conference—Mr. Sheldon's address on "The Science of Salesmanship." From what we in London already know of Mr. Sheldon's work and personality, it may be confidently expected that the members of this Association will derive from his address no little stimulus and help in the study of the science and art of what he terms "Business Building," which is a very different matter from mere selling; and that thus strong impetus will be given to the development of the commercial side on sound, honourable, and truly profitable lines.

Of course, it is also necessary to have a staff abreast of the newest practice in the applications of gas. I have no intention of entering upon the thorny topic of technical instruction, apprenticeship, and so forth; but it is quite certain that this part of the work of preparation must also be done, and done to good purpose under local conditions, if full success is to be attained.

Thirdly, I set store by the requirement to seek out the actual needs of all classes of consumers, and satisfy them. This is a part of our work which lies over and above and beyond our old professional ambition to sell gas at the lowest possible figure. This we must, of course, still do; but we can no longer afford to leave the other duty undone. How much can be effected by direct cultivation of special lines of business—by specializing in canvassing, in short—our energetic Chairman of the Executive Committee, Mr. F. W. Goodenough, could testify from an exceptional experience of aggressive effort on behalf of the Gaslight and Coke Company. I will in this connection merely bespeak your attention for the paper to be given us by Mr. Creasy, who has taken in hand the London doctors, and fought their prejudices inch by inch, until he has converted them by hundreds to bless gas where they previously banned it.

What I am concerned for is that these attacks should become general, all along the line. Government officials, architects, school teachers, sanitary authorities, should never be allowed to remain in ignorance of the virtues of gas. And yet there is more. I am not satisfied that everything has yet been attempted in the right way to create appreciation of the advantages of gas for the poor. Those small, low smoky chimneys which one sees on railway journeying through London, and in the Provinces too, weigh upon my conscience. It is not, in most cases, that gas obtained by the agency of slot meters is not cheap enough. I am afraid the trouble lies further back, and proceeds from the inability of poor housewives to make proper use of it.

An experiment might, I am sure, be hopefully tried upon

a chosen district of distinctly poor dwellings, with the object of ascertaining precisely what kind of help could be beneficially extended to enable the people to live more comfortably. I am quite sure that this is not a matter for almsgiving. It is one of the disappointments of our costly elementary educational system that it has done apparently so little to raise the standard of household economy. Such an experiment as I suggest would yield material that could not fail to be useful. An examination of the small cottages in which the labourers and poorer mechanics of our towns live would show one thing clearly—that decent cooking is practically impossible with the apparatus provided. I have said before, and I repeat, that among the social needs of the day, the knowledge of cooking by the wives of our workers holds a chief if not the foremost place. But the knowledge would be of comparatively small value in the absence of appliances; and these the gas authorities can afford. The subject is tempting; but I can carry it no further now. More will I trust be heard of it shortly.

The assistance which the Association has in the short period of its existence been able to render, and which as time goes on it will be more and more able to render, to the subscribing undertakings—both by the supply of publicity material at co-operative prices, and by expert advice on local work and in local difficulties—has already more than satisfied those subscribers that they are getting value for their money.

I feel, therefore, hopeful that it is only a matter of time, and a short time, before the roll of subscribers to the Association contains the name of every gas undertaking in the country, whether it be a private or a municipal enterprise. It is inconceivable that any director or councillor, once he is satisfied as to the value of our work, will be content to allow other undertakings to bear the cost of endeavour from which all reap a harvest, whether they pay their share of the seed-sowing or not.

So far, in addition to the valued financial assistance and co-operation of the Society of British Gas Industries, we have secured the support, according to output, of only about one-half of the whole industry. This, while naturally somewhat disappointing to those of us who are enthusiastic believers in the value of the work and its importance to the industry, cannot be regarded as other than a substantial achievement when all the initial difficulties of establishing such an enterprise, and securing for it not merely verbal but financial support are calmly reviewed.

For this result, the thanks of the industry are due—first, to the members of the Commercial Sections of the District Associations of Gas Managers, who mooted the scheme and carried it to the point when it was taken up by the Institution. Secondly, to the members of the Publicity Committee of the Institution, who brought the matter to the point of launching the enterprise which we are now engaged in carrying forward. And, finally, to the members of our General and Executive Committees, who have devoted, and are devoting, so much time, thought, and energy to the work of the Association.

I cannot conclude without repeating my sense of the debt the Association owes to the gas authorities in Manchester and Salford, not merely or mainly for their hospitality on the occasion of our first annual meeting, but because of the splendid example which they, at a critical time in our history, set to other municipal gas undertakings (and indeed to all gas undertakings) by their whole-hearted support of this national movement for the advancement of the industry, and for the benefit of the public which it serves.

REPORT BY THE GENERAL COMMITTEE.

The General Committee present to the members of the Association their first report upon the work which has been carried out in the interests of the industry as a whole since the Association commenced its work.

It is now many years since the necessity for the development of the public service (or sales) side of the business of gas supply in a scientific, organized, and energetic manner first began to be realized by the more progressive spirits in the industry, and individual undertakings began to deal with the question separately and locally. It is more than five years since the first paper dealing with this aspect of the business in a comprehensive manner was presented to the Institution of Gas Engineers. It is two and a half years since a scheme for co-operative publicity was first put forward and discussed by the Commercial Sections of the District Associations of Gas Managers on the initiative of the Southern Section.

It is just a year since the conference held in London approved the constitution and rules of this Association, and gave the order to "go ahead," trusting to the public spirit of those controlling the many undertakings which had not then decided to support the movement to bring the Association adequate means for the prosecution of its work, so soon as that work proved itself profitable to the industry in all parts of the country. For some months afterwards the preliminary work of organization proceeded, until in March last the offices of the Association were opened, the staff was appointed, and public work commenced.

To many of those who realized the need of this work and were anxious to see it begun, no doubt the time that elapsed from the first mooting of the subject until the Association began its active life seemed far too long. But it must not be forgotten that an industry which flourished exceedingly on old methods for nearly 100 years is not to be awakened to the need of regeneration in a few months.

Taking a dispassionate view of the history of this movement, its supporters must feel rather encouraged by what has so far been accomplished than disheartened by the amount still to be achieved before the campaign of progress receives universal support, and can, as a consequence, be developed on comprehensive lines, instead of on the limited scale which has so far been all that was possible.

The list of undertakings supporting the Association has grown steadily, though none too rapidly, since its formation a year ago, and now contains the names of 252 municipal and company undertakings. The Committee are very glad to be able to include in the list two Overseas undertakings—those of Melbourne and Shanghai.

Including the substantial sum contributed by the Society of British Gas Industries, whose members readily realized the value of co-operative action to all who are interested in the manufacture and supply of gas, the income assured from the undertakings mentioned is about £12,500, which is being spent for the benefit of all.

The accounts deal with a year during which work was in active progress for only about six months, though expenditure on preliminary organization had been going on for many months earlier. The accounts therefore show a substantial balance in hand. But that is fully mortgaged for immediate expenditure; and the Committee are continually hampered in their operations by the lack of additional funds. The work that could be done with advantage to the industry throughout the Empire has only up to the present been commenced in a partial manner.

To read the list of publications in which advertisements dealing with the advantages of gas and correcting popular fallacies and prejudices are appearing (none too frequently) is to realize at once that there are more names missing from the list which should find a place there than those which do appear.

To consider the amount of scientific research that could profitably be undertaken, and the assistance that could be rendered to the educational, sanitary, medical, and architectural professions in the study and application of the principles of hygienic and economical lighting and heating, is to realize at once that such work is most necessary, that it cannot be done effectively except by co-operative action, and that it cannot be done at all except at considerable cost.

The Committee, however, while desirous of impressing upon those having command of the purse-strings of the industry the urgent need of more funds and the profit to be derived by all from increased expenditure, feel justified in reporting that much useful work has been accomplished in the short time that the machinery has been at work. The advertisements which have appeared, and which have been designed to attract by their form, to convince by their argument, and to create ultimate satisfaction by their truth (the foundation of all successful advertising), have attracted wide-spread interest and have been productive of excellent business results.

Inquiries have been received from all quarters of the country and from abroad as a result of the Association's advertisements, the total number to date being no less than 3250. Of these, three-fourths have come from the districts of non-subscribing undertakings—showing that the work which is being done by some is of advantage to all.

The present abnormal output of gas and the demand for

stoves throughout the country cannot justly be ascribed entirely to the work of the Association. There can, however, be no question but that its work has contributed materially to this satisfactory state of affairs. The coal strike and the dismal "summer" weather had much to do with creating the "boom;" but the fact that gas as a fuel had been, and was being, prominently brought to public notice in an effective manner when the strike and the unseasonable weather occurred, was of the greatest value to every undertaking, and especially to those which are most active locally in developing the sale of gas.

To such of those progressive undertakings as are subscribers, the Association is proving of great service in two ways. In the first place, it saves the local officials from having to design and write their own advertising matter. This is done for them by the Association's experts. In the second place, it provides first-class advertising literature at co-operative prices, which are far below those at which such material could be designed, printed, and produced locally in small quantities. Up to the present, the sale of pamphlets, postcards, &c., exceeds 700,000.

By supplying material for local publicity work at a very low cost, the Association is rendering the more progressive of its supporters a service which repays to them a large proportion of their contributions, quite apart from the benefit they derive from the national publicity campaign.

In yet another way is the Association returning full value to its supporters. It is creating among all who enter into its work—all who follow its operations with interest, who read and contribute to its "Bulletin," who make use of its services and render service to it—a spirit of unity and co-operation, an increased and increasing enthusiasm for progressive methods, and a higher standard of service to the public, which are bound to be of value to the individuals themselves, to the undertakings they serve, and to the industry as a whole.

Moreover, the Association is not merely an instrument of publicity, though—be it said to those who are inclined to regard publicity work as beneath the dignity of the gas profession—advertising, once a blatant business associated principally with quack remedies, is in a rapidly-increasing measure becoming an honourable and scientific profession, based upon truth and honesty, and to-day forms an integral part of every progressive business. The Association is also, as its first conference is designed to prove, a valuable organization for the mutual study and discussion of the high politics of commerce and for the perfecting of profitable public service.

The work of the Association is complementary to that of the Institution of Gas Engineers, and of vital importance to the whole industry. It is no use manufacturing cheaply that which you cannot sell.

The Committee are glad to report that some 83 officers of subscribing undertakings who are engaged in the public service side of the business have become Associate Members. They hope that a very much larger number will be put forward for election by managers in the near future. Such Associate Members are, for an annual subscription of 10s. 6d., entitled to receive the "Bulletin" each month and to attend all general meetings. It is believed that, through the increased interest in the public service aspect of gas supply that would be created by constant touch with the Association's work, the value to their employers of officers put forward for election as Associates would be increased far beyond the cost of the subscription.

The Committee are especially happy to be able to report the election of six International Members, most of whom are members of the National Commercial Gas Association of America—a very active organization with which this Association is in constant, friendly, and helpful correspondence. Members of this Committee have joined the American Association (to which the subscription is 21s. a year), and are thereby enabled to keep in close touch with the progressive ideas of their friends on the other side.

The "Bulletin," which has been established as the organ of the Association, has met with a very gratifying reception. The Committee would be glad to see the name of every director and councillor, as well as of all "public service" officers, on the list of subscribers to the "Bulletin," which is supplied at the modest figure of 4s. per annum.

As a result of their experience of the working of the rules of the Association, the Committee put forward certain amendments for the consideration and, they hope, approval of members at the general meeting. No questions of principle are involved; the alterations being designed simply to facilitate the working of the rules as a whole, and to make the constitution of the Association as acceptable as possible to the industry. The proposed amendments are detailed in an accompanying memorandum.

In concluding this report, the Committee would express the hope that the work which has been done will commend itself not only to those who have made its performance possible—and so secure their continued sympathy and support—but also to those who did not at once see their way to contribute towards the cost of a national campaign—and so secure that additional measure of support which would enable the Committee to develop the work upon such broad lines as would, they are convinced, prove of the utmost value to one and all.

CORBET WOODALL, President.
F. W. GOODENOUGH, Chairman of Executive.

47, *Victoria Street, Westminster, S.W.*,
Oct. 1, 1912.

UNIVERSITY DISTINCTIONS FOR GAS ENGINEERS.

Honorary Degrees Conferred upon Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. Thomas Newbigging.

At a Congregation of the University of Leeds, held in the Great Hall last Thursday, the Chancellor (His Grace the Duke of Devonshire) conferred, in accordance with a resolution passed by the Court on the 23rd ult., as notified in the "JOURNAL" next day, the Honorary Degree of Doctor of Science upon Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. Thomas Newbigging.

Professor COBB, the Livesey Professor of Coal Gas and Fuel Industries at the University, in presenting the above-named gentlemen to the Chancellor, said: This year is the centenary of the foundation, under statutory authority, of the great industry of gas lighting—the fruition of earlier pioneer efforts which will always be associated with the name of William Murdoch. The University of Leeds, which has enjoyed in so great a degree the co-operation of the profession in establishing higher scientific education directed to the special needs of the gas industry, wishes to take the opportunity of doing honour to representative men standing foremost in its ranks. Mr. Corbet Woodall has been for more than forty years connected with the Metropolitan gas industry, and in a life of achievement has amplified and enriched its record of technical development and commercial expansion. As Governor of a vast undertaking, he has shown the capacity of a great industrial general, and in reaching success has won the admiration and affection of workers whose well-being not less than their efficiency has been his constant care. The honour in which he is held by his profession is attested by his election as President of the Institution of Gas Engineers in the year of its Jubilee, and at the same time by his occupancy of the presidential chair of the Society of British Gas Industries and of the British Commercial Gas Association. Of Mr. Charles Carpenter's distinctions none can be more honourable, more acceptable to him, and none so appropriate in this place, as to entitle him, the successor of Sir George Livesey, the man whose eminence of service and nobility of character have, to our honour, been commemorated in the University of Leeds by the establishing of a professorial chair. Mr. Carpenter's consciousness of the inheritance of a proud tradition and his own resourcefulness, initiative, and gifts for organization and for the furthering of industrial research, have united to make his standard of achievement high, and his work conspicuous in its thoroughness and in its well-deserved success. Mr. Thomas Newbigging is a veteran leader who receives the willing homage of the whole gas engineering profession, and whom the University of Leeds would also like to honour as it may. He has long inspired a high degree of intellectual appreciation which has ripened with the lapse of years into a more personal veneration and regard. By that careful sifting of innumerable experiences which Science has learnt to value in any field, he has brought order and principle into gas-engineering practice, and made his name the recognized symbol of sound and systematic work for every gas engineer. Such complete mastery of minute detail and firm grasp of underlying principles have, in his case, been happily combined with the power of exposition and a sure instinct in the choice of word and phrase.

After the degrees had been conferred, Doctor CORBET WOODALL, in returning thanks, said: On behalf of Dr. Newbigging, Dr. Carpenter, and myself, I desire to tender to your Grace and to the Court of the University our thanks for the honour you have conferred upon us, as representing an industry which is holding this year the centenary celebration of its statutory existence. What an epoch in the scientific and industrial life of the nation and of the world that hundred years represents! We have had another centenary in the course of this year, and that has been the launching of the first steamer in British waters. I am glad to say that during that long period of change and development, the

industry which you have honoured in our persons to-day has continued to prosper, and is now, I believe, as prosperous and as necessary to the comfort and well-being of the community as ever it was in the past. Some little time ago, my Lord Duke, some of us felt desirous of commemorating, of perpetuating, of keeping green the memory of a man whom we held in much esteem and love because of his work and personality. We were delighted to find, upon approaching the University of Leeds, that they were willing to take part with us in this effort; and so the Livesey Professorship of Coal Gas and Fuel Industries was instituted. That has not only accomplished the purpose which we had in view, but it has led to the foundation of a school which, in regard to fuels, the distillation of coal and kindred work, has prepared the way for the training of men who shall carry on in the future the work that we have tried to do in the past, and will equip them to keep in line with the advancement of the time and with the scientific progress of the age. I cannot speak, from personal knowledge such as is possessed by most in this room, of the work done by this University. Even I, however, know enough of the story of the Yorkshire College and of its more dignified successor here to-day to be able to congratulate Leeds and the great manufacturing district of which it is the centre upon what has been accomplished. Of the great success which has characterized the textile industries of Yorkshire, which has put them into the honoured position they now occupy amid the competitions of the world, a considerable proportion may be very fairly ascribed to that College and this University. And I venture to think also that, in a community where the stress and strife of competitive manufactures is carried on as it is in Leeds, the institution of a centre of culture and refinement such as this cannot but be of immense value. May the University continue its beneficent work to the increasing benefit of the city and its neighbourhood.

At the close of the ceremony, the new graduates were entertained at luncheon by the Pro-Chancellor (Dr. A. G. Lupton) and the Vice-Chancellor (Dr. Michael Sadler) of the University.

OBITUARY.

The death took place last Friday week, at his residence in Bridge of Weir, of Mr. JAMES LAUDER, who was the Gas Manager of the village. He went there from Johnstone fifteen years ago.

Mr. JOSIAH EASTON CORNISH, M.Inst.C.E., the Chairman of the Alexandria Water Company, died suddenly last Wednesday. Mr. Cornish, who was born in 1841, was a son of Mr. T. S. Cornish, of Bradford, near Taunton. He served with the Expeditionary Force in Egypt in 1882, and received the Third Class of the Medjidieh. In the same year he was decorated with the C.M.G.

The death took place on Saturday, the 28th ult., of Mr. EDMUND DAVY, of Elsecar, head of the firm of Messrs. J. Davy and Co., Limited, ironfounders. Deceased, who was in his seventy-first year, was at business on Friday, but was found dead in bed next morning. An inquest was held, and the Jury returned a verdict of "Death from natural causes." Mr. Davy and his two brothers, Messrs. John and Fred Davy, were Directors of the Elsecar, Wentworth, and Hoyland Gas Company. At the funeral on Tuesday, the Company were represented by Mr. Thomas Hewitt (Director), Mr. W. Stenton (Manager), Mr. A. F. Hall (Secretary), and some of the workmen.

Manchester District Institution of Gas Engineers.—We learn from the Hon. Secretary (Mr. W. Whatmough, of Heywood) that the usual October meeting of the Institution has been postponed until the last Saturday in November, and it will be held at St. Helens. Particulars will be announced in due course.

Dessau Vertical Retort Contract for Leeds. — Messrs. Leech, Goodall, and Co.'s tender of £15,632 for a complete installation at the Meadow Lane Gas-Works of one bench of five beds of Dessau vertical retorts, with contained producers, having a total daily capacity of 1,100,000 cubic feet of gas, has been accepted by the Leeds City Council.

Woodall-Duckham Verticals for Cleckheaton.—The Clerk to the Cleckheaton District Council has been instructed to apply to the Local Government Board for power to borrow £57,150 for the provision of new gas-works. The tender of the Woodall-Duckham Vertical Retort and Oven Construction Company, Limited, for the supply and installation of vertical retorts required for the new scheme has been accepted by the Council.

Research Fellowship in Gas Chemistry.—It will be seen, from an announcement which appears elsewhere, that applications are being invited by the University of Leeds for an open fellowship of £100 per annum, established by the Institution of Gas Engineers, for the prosecution of post-graduate research in gas chemistry in the Department of Coal Gas and Fuel Industries. The latest time for sending in applications is the 15th inst.

Southern District Association of Gas Engineers and Managers.—We learn from the Hon. Secretary and Treasurer (Mr. W. E. Price, of Hampton Wick) that it has been arranged to hold the next meeting of the Association on the 14th prox., at the Hotel Cecil, Strand. Papers will be contributed by Mr. J. Fisher, of Tottenham, Mr. G. M. Gill, of the Commercial Gas Company, and Mr. W. G. Head, of the South Metropolitan Gas Company. Particulars will be sent to the members later on.

GAS ACTS FOR 1912.

[SECOND ARTICLE.]

IN this section of the review of the Gas Acts, we deal with those statutory concerns who have asked of, and obtained from, Parliament extended powers. Readers will still bear in mind that these articles are mainly directed to showing any variations from the original Bills that have taken place during the parliamentary career of the measures, and do not therefore comprise such a complete review as was made when the Bills were under notice. The Acts referred to this week were dealt with in their initial form as Bills in our issue for Jan. 16 last.

The Annfield Plain and District Gas Company have obtained the extension of their area to part of the parish of Iveston and the district of Stanley; and the powers of the Shotley Bridge and Consett Gas Company have been determined so far as they relate to the portion of Iveston in question. Lands and works powers are bestowed; and the "chemical clause" has been thrust upon the Company. The additional capital, dividend, profit-sharing, and stand-by clauses are all intact as they appeared in the Bill. The Company have been relieved of the obligation to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of the main is insufficient for such purpose, or if, and so long as, any such supply would, in the opinion of the Company, interfere with the sufficiency of the gas required to be supplied by means of such main for lighting purposes. The clause has been deleted in which authority was sought to provide premises that cannot be conveniently supplied with gas from existing mains with plant for the generation of acetylene, gasolene, or suction gas. [*Parliamentary Agents: Messrs. Lees and Co.*]

Parliament has agreed that it is expedient that the Bognor Gas Company should be empowered to supply electricity for public and private purposes within their gas limits as defined by their Act of 1908; and to use their gas lands for the purpose of a generating station. The Company are, within two years [not three as mentioned in the Bill] after the passing of the Act, to lay down suitable and sufficient distributing plant in a scheduled area. If, too, at the expiration of five years after the passing of the Act, the Company have not laid down distributing mains in the rural district of West Hampnett, the Board of Trade have discretionary power to order that the authorization shall cease where the mains are not laid. The capital powers and terms in the Act are the same as in the Bill, except that the reduction of the additional capital from £30,000 to £12,000 is to take place in two years instead of three, in the event of the Company failing to commence operations under the terms of the Act. Protecting clauses have been given to the Brighton Railway Company, the Bognor Water Company, and the West Sussex County Council. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Benefit Fund Act of the Brighton and Hove Gas Company (similar Acts have been obtained by other companies) is, in all respects but two small changes, in the terms set out *in extenso* in the "JOURNAL" for Jan. 16 last. The two alterations occur in clause 4; and, by looking at the original clause, it will be seen how, by the insertion of the word "weekly" before the word "servant" the first time it occurs, discrimination has been made as to the class of employees who are to benefit by the powers conferred by the Act. At the end of the same clause, words have been added which ensure that the purposes for which the creation of the fund has been granted, shall be entirely met out of it, and not from, in addition, any other source. The new words are: "And no such gratuity, pension allowance, payment, or benefit, as is mentioned in this section (other than sick pay) shall be granted or paid to any such servant, widow, family, or dependant otherwise than out of the benefit fund." [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Christchurch Gas Company have secured the extension they desired of their limits of supply to Milton, Hordle, and Milford, and the part of the parish of Highcliff not included in their limits under the Act of 1877. But "if at any time after the expiration of four years from the passing of the Act, the Company are not furnishing, or prepared on demand to furnish, a sufficient supply of gas, in accordance with the provisions of the Act throughout the district of any urban district council that may be constituted for any part of the new limits of supply, such council or any company, body, or person, may apply for an Act of Parliament or Provisional Order for the purpose of supplying gas in any part of such district not sufficiently supplied by the Company as if this Act had not passed." The whole of the capital, dividend, and borrowing powers conform with the proposals when the Bill was under notice. The lands and works clause has had the words "by them" embodied so as to restrict residuals dealings and working-up to the secondary products arising out of the manufacture of gas by the Company. There is a new clause limiting the maximum price of gas to 5s. within the borough of Christchurch as at present constituted, and 5s. 6d. outside; but the outside price is not to exceed 6d. more than is charged in the borough. All other clauses remain as when the Bill was noticed, including the stand-by clause in respect of both gas and electricity. A large batch of protecting clauses have been inserted in favour of the Southampton County Council, the

Christchurch Corporation, the Lymington Rural District Council, and the London and South-Western Railway Company. In the clauses obtained by the Christchurch Corporation, it is enacted that pipes are to be laid, if possible, at a depth so that not less than 2 feet intervene between the surface of the road and the top of the pipes. Some private owners have secured protection for their property. The Company, for instance, are not to erect a retort-house or purifiers on the scheduled land within a distance of 300 feet from the "building of the dwelling-house" near to the south-westerly corner of the land; and before erecting any works for the manufacture of gas upon the lands, they are to plant, and afterwards maintain, two rows of suitable trees adjoining and alongside the western boundary of the land, and extending from the road from Highcliff to New Milton, for 280 feet. Another owner has obtained the right to have two rows of suitable shrubs and trees planted and maintained upon the land adjoining and alongside the northern and eastern boundaries of his premises. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

In the Dunstable Gas and Water Company's Act, the capital powers sought in respect of the gas undertaking have been granted precisely as described when noticing the Bill. A clause, however, has been inserted amending the provisions of section 49 of the Company's Act of 1871, in so far as they relate to the price of gas in the borough, so that 4s. 2d. is substituted for 5s.; and section 50 of the Act named has also been amended, so that it is enacted that the price of gas for the supply of the public lamps shall not exceed 3s. 4d. The "chemical clause" has been inserted. All the other gas clauses are in ordinary form. Protecting clauses have been granted to the Corporation, to the London and North-Western Railway Company, and to the Great Northern Railway Company. In the Corporation clauses, we see an exemption for liability for damage occasioned by the ordinary use of any roller not exceeding 12 tons in weight. Very simple transfer powers are conferred upon the Corporation in a couple of clauses found in the Act.

It shall be lawful for the Corporation at any time, upon the request in writing of twenty or more persons for the time being rated to the general district rate of the borough of Dunstable, followed by the subsequent assent at a poll of two-thirds in number of votes of the persons for the time being so rated and voting (the voting at such poll being conducted under the same regulations as the voting for the election of town councillors), to require the Company to transfer the undertaking and their interest in the same to the Corporation.

The Corporation shall not exercise the power of acquiring the undertaking until after the expiration of six calendar months' notice in writing to the Company in that behalf; and the price to be paid to the Company by the Corporation for such transfer, and the terms and conditions upon which the same shall be made, shall be such as shall be mutually agreed upon between the Company and the Corporation, or, as, in case of difference, shall be ascertained by arbitration in manner prescribed by the Railways Clauses Consolidation Act, 1845, in which arbitration the arbitrators shall, in addition to the allowance to the Company of the costs charges and expenses of the Company of and incident to the application for this Act, take into consideration all the circumstances of the case.

There are no other points requiring notice. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Gas Companies (Standard Burner) Act is in the same terms as the similar Act of 1910. An addition is made by giving the Corporation of Portsmouth the right to provide and maintain at their own expense, four additional testing places within a radius of two miles from either the Flathouse or Hilsea works of the Portsea Island Company, in such situations as may be reasonably approved by the Company, or, failing agreement, determined by an engineer to be appointed on the application of either party by the Board of Trade. Notice of defective illuminating power (if any) of the gas supplied by the Company may be served at either the Flathouse or Hilsea works of the Company at the discretion of the Corporation. The promoters of the Bill were the Ashton Gas Company, the Brierley Hill District Gaslight Company, the Town of Dudley Gaslight Company, the East Grinstead Gas and Water Company, the Folkestone Gas and Coke Company, the Gravesend and Milton Gaslight Company, the Horley District Gas Company, the Portsea Island Gaslight Company, the Redhill Gas Company, the Rugby Gas Company, the Southend Gas Company, the Stroud Gaslight and Coke Company, the Sunbury Gas Consumers' Company, Limited, the Sutton Gas Company, and the Whitby Gas Company. It is proposed that the Act shall come into operation on Jan. 1 next. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Houghton-le-Spring Gas Act gives the Company the extensions that were mentioned when reviewing the Bill in January last, as well as two or three other parishes; but the Chester-le-Street Rural District Council have had it decreed that, if at any time after the expiration of five years from the passing of the Act, the Company have not laid down the necessary mains for supplying gas, or are not furnishing, or prepared on demand to furnish, a reasonably sufficient supply of gas in any of the parishes of South Biddick, Bournmoor, Little Lumley, Great Lumley, Lambton, and Cocken, nothing in the Act is to prevent any company, person, or local authority, having statutory power so to do, from supplying gas in all or any of the parishes in which the Company are not either supplying gas or prepared to supply on demand. Moreover, the Company are not to oppose any application by the Council of any urban district in which any such parishes, or any part thereof may be comprised, or by any company or person, for an Act or Provisional Order for the purpose of providing such supply. The North-Eastern Railway Company have secured protecting powers. Capital, dividend, borrowing powers, and price of gas are in the exact terms alluded to in our review of the Bill. The Company have obtained the clause exempting them from penalty for neglecting or refusing to give a supply of gas, in accordance with the provisions of the Act, to anyone using suction-gas plant, if and so long as the giving of such a supply would interfere with the supply of gas for public and private lighting, and to consumers not using such plant. In the event of any difference or dispute arising as to whether the supply of gas would be interfered with, reference is to be made to arbitration in the manner provided by the Arbitration Act, 1889. A stand-by clause relating to gas plants has been secured; and the chemical clause has been inserted. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

The Lea Bridge Gas Act deals with the establishment of a benefit fund for the Company's servants and dependants, in the same terms as in the case of the Brighton and Hove Gas Company's Act. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In the Leatherhead Gas Company's Act, the principal powers refer to the acquisition of the Cobham Gas Company on agreed terms, which were set out in the summary of the Bill published on Jan. 16 last. Capital powers are also in the terms then described; but we see that the standard price of 4s. 4d. prescribed in the 1901 Act has been put 2d. lower. The price in Cobham is not to exceed by more than 6d. that in the Leatherhead area. The "chemical clause" appears. A suction-gas clause (similar to the one in the Houghton-le-Spring Act) has been granted; but there seems to have been excision of the stand-by clause. In other respects the salient provisions of the Act are covered by our notice of the Bill. [*Parliamentary Agents: Messrs. Hargreaves and Crowthers.*]

The Maidenhead, the North Middlesex, and the Southgate and District Gas Acts are "Benefit Fund" measures on precisely the same lines as the Brighton one. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

The Judgment of the "Electrical Review"—"Frightful" Electrical Dangers—The "Queen's Head" in a Police Court—Litigation over Cooking Charges—The Customer's Share of Original Raw Meat—The Brighton Shop-Lighting Case—More Literature.

THE "Electrical Review" could not wait until the Board of Trade inquiry had been held in connection with the Ditton Junction disaster before it recommenced to wander—in the strange, fumbling way that has been observed before—amid the "tortures" of death from fire. It is not a pleasant subject. We all know that death from fire must be a terrible thing. It must have been a terrible death suffered by those poor girls at Clapham and Accrington, by the music hall artistes at Edinburgh, by the American actor at the Carlton Hotel, and by numbers of other people whose deaths are traceable to fires electrically generated. But the "Electrical Review" never raves about the "tortures" in such cases. When they occurred, it probably laid its head on the pillow at night time, and slept the sleep of the hardened unjust, because it was electricity that was involved, and not gas. Nor has it ever, after such events, gone down on its knees, and fervently prayed that the Government should abolish electric lighting from drapers' shops, music halls, theatres, hotels, and all places where death has occurred in consequence of its use. But on every conceivable occasion the "frightful dangers" entailed by the use of gas for lighting and cooking on railway trains are trotted out, and the Board of Trade are reproached for not setting to work to compel the installation of electricity, which is accountable for having trapped and "tortured" to death in divers places so many people in recent years.

Our contemporary in its latest declamation upon the subject of "torturing" and "frightful dangers," at first kept clear from directly charging gas with having caused the fire on the train; but before it had got more than two-thirds through its article out came its final judgment: "To argue that gas was not to blame is to fly in the face of reason." The Board of Trade will, after this, only be wasting time in holding an inquiry, other than into the cause of the accident. The matter was generally discussed by us on Sept. 24 (p. 803), so that, if the "Review" person or persons responsible for the foregoing judgment will favour us by reading what was then said, it will save repetition. There is only one other point on which to make remark. The "Review" says that the Inspectors of the Board of Trade have "on various occasions *definitely* attributed fires to the use of gas." Major Pringle in his Hawes Junction report last year wrote: "This is actually the first occasion when it can be proved, beyond question or doubt, that fire was occasioned by burning gas. It has to be remembered also that gas has been in use for lighting purposes for a very long period, and that during the whole of that time—in fact, since the year 1868—there is no case of fire destroying either the lives or bodies of passengers in railway accidents." We are inclined to think that Major Pringle knows as much about this matter as the "Review."

In the electrical press the same week, and in the Sheffield papers, we see that a youth was on Sept. 17 electrocuted in

a garage yard, supplied or formerly supplied (we do not know which) with electric current by the Sheffield Corporation. It seems that the youth grasped a piece of displaced tubing through which an electric wire ran, and to which wire at some time or other an electric light fitting was attached. Whoever made the disconnection of the fitting—no one seems to know who did it, no one owns up to it, and it appears to have been nobody's duty to examine the electrical fittings in the place—left the wires exposed. When the unfortunate youth (whose name was Imisson) touched the pipe, he gave, his companions testified, an "agonized scream," and he died before reaching the hospital. At the Coroner's inquiry, the jury failed to establish who was the person to whose negligence the death of Imisson was due. It is also observed that investigation has been made into the deaths of the widow and little girl who died on Aug. 26 through touching a fallen live electric wire at Dingwall. The jury found that, had the fuses at the generating-station been in proper working order, the accident would not have happened, and they recommended that the whole system should be inspected by an expert, in order to see that the wires are properly protected at all public places. In the same issue of the "Electrical Review" as the one in which they invoked the aid of the Board of Trade in evicting gas from railway trains, and putting electricity in its place, there was a paragraph reporting the reading of a paper by Dr. Charles A. Lauffer, of Pittsburg, before the Pennsylvania Electrical Association, on the subject of resuscitation after electric shock. Our contemporary mentioned that, in the discussion which followed, Mr. Liversidge cited a case where victims had died from electric shock on 110-volt circuits (!), because they were taken away on ambulances before any method of resuscitation could be applied. The "Electrical Review" has much work before it to clear off the face of the earth the frightful dangers and the means of torture that obsess humanity, many of them of electrical origin. When "Meteor" finds four gas-lamps temporarily inactive he starts moralizing over the heinousness of the offence compared with such insignificant affairs as the total collapse of the electricity supply in such wide areas as Islington and Ilford. The "Review" seems to occupy a front seat on the same platform.

There has been quarelling—aye, and even litigation—over the electricity consumed at "The Sign of the Queen's Head" at Earl's Court. The electricity that has produced contention is that used for cooking, anent which we were recently told in the electrical papers that the caterers were well pleased with the modest requirements of energy for the purpose. But electrical cooking seems to have been responsible for a large part of the account for electricity supplied to Earl's Court during July; the lucky vendors and unlucky plaintiffs being the Brompton and Kensington Electric Supply Company. The July account for electricity came to £132; and no less than £87 18s. 4d. of this was disputed in connection with the cooking at the Queen's Head. This £87 18s. 4d. represents 10,550 units at 2d. per unit. We do not know whether the Earl's Court Exhibition authorities were disputing liability for all this balance; if they were, then some of the difference between the sum and the £132 also fell to the cooking account. However, the main question was the price that was to be paid for the energy used for this purpose. It is quite clear that, though the Queen's Head electrical cooking exhibit is in their very midst, the Brompton and Kensington Company do not anticipate harvesting so much grain from it that they are disposed to give the energy away free for the purpose. The reports of the case state that a large proportion of the current used at Earl's Court was for cooking and heating; and as cooking and "heating" were only carried on at the Queen's Head by electricity, if the charge made for current for these purposes had to be paid during the whole run of the exhibition, the final balance-sheet of the Queen's Head would be a document worth perusing. The trouble arose in this way: An agreement was entered into between the parties under which electric current was to be supplied for lighting at 2d. per unit up to 75,000 units, above that number 1¾d. per unit, above a further quantity 1½d. per unit, while energy for power was to be charged at 1d. per unit. The tenants of the Queen's Head cannot afford to pay much for the heat units from the current used for cooking; and so it was contended, on the part of the Earl's Court Exhibition authorities that the charge for current used for cooking should be at the power rate. The Electricity Supply Company contended otherwise—that cooking is not power, and that there was the agreement governing other uses than power. The July account, of course, only represents a period of the run of the exhibition. There are the previous months' accounts and the succeeding ones; so that if just upon £88 represented the expenditure for current in connection with the electric cooking demonstration for one month, then there has been a substantial quantity of current used for the purpose.

As, however, according to the millionaires of the electricity industry, it is so "cheap," to cook by electricity, it is a pity there was any contest over the money that there was to pay for the energy for cooking. According to the electrical creed, there is such a saving in "meat" when it is subjected to the considerable heat of electricity, that the caterers ought to have saved much more than the amount of the electricity bill in the smaller quantity of raw meat they were called npon to purchase than if they had used other means of cooking to meet the needs of their patrons. When we have sat down to an under-shocked steak or chop at the Queen's Head—steaks or chops being much the same size as those procurable elsewhere—we have wondered how much less raw meat that steak or chop represented than would one have done of similar cooked dimensions elsewhere. We felt there was ground for grievance against the caterer who—if all that is said be true—used a smaller proportion of raw meat for our steak and chop, and affected to make up for it by giving us a stratified steak containing a larger proportion of water than we should have had elsewhere by having a properly cooked steak the original of which weighed more, and therefore gave something more substantial for our money. Of course, we are looking at the matter from the electrical point of view—*vide* Electricity Publicity Committee, Seabrook, Borlase Matthews, Cross (Mrs.), Prentice, and other celebrities in the electrical industry—not that we believe in robbing ourselves of good substance, and making up for it with water. However, we are sorry our experiments, through the electricity expended, at the Queen's Head con'ributed to increasing the amount in dispute for the electricity account. When before Mr. Fordham at the West London Police Court, neither of the disputants would give way. The Electricity Company wanted its full pounds in coin of the realm, while the Queen's Head persisted in offering something less substantial, which is typical of electrical cooking. Mr. Fordham had a sympathetic place in his heart for the struggling electric cooker; and he therefore reduced the £87 18s. 4d. to £26 4s. 6d., with £2 2s. costs. But neither party was satisfied; and they were—in the police court—athirst for each other's blood. Both asked his Worship to state a case; and Mr. Fordham agreed to do so, if a point of law was placed before him at a later date.

Another letter has been published in the "Electrician" on the question of the recent conversion of some shop front lamps at Brighton from gas to electricity. This time it is not Mr. John Christie, the Borough Electrical Engineer, who writes. He has apparently relegated the task to the happy contractor who carried out the job—Mr. E. E. Fellingham; or perhaps that gentleman is a good opportunist, and has voluntarily taken hold of the occasion to further ingratiate himself with the one whose hand is able to bestow favours. It matters little which it is. Having, however, read with care this gentleman's bald effusion, we do not see that it in any way affects the statement of facts which we lately laid before our readers. In no single respect does he disprove that, if the rival lamps were photometrically tested with the equality of surroundings that can only be obtained in a photometer room, and not outside differently dressed shop windows, the lighting efficiency, and the economy of cost with electricity at 3d. per unit, would be on the side of the high-pressure gas-lamps. The weak part of the "Electrician's" attitude in this matter (just as was the case with the "Electrical Times" in the Croydon controversy) is that they publish only the statements from the electrical side, and not those presented from the gas side. The original communication in our contemporary, drafted from particulars furnished by Mr. Christie, was reprinted by us; but the "Electrician" did not publish our reply. There is one point in Mr. Fellingham's letter which needs mention. He says: "The statement in the 'JOURNAL,' that the recent concession given to the consumers of over 15,000 units per annum of 3d. per unit was the real factor that decided the question, is very wide of the mark. My clients have been enjoying the concession since *June quarter day last;* and the recent contest was quite independent of that." According to the "Memoranda" published early in August, the concession to 3d.—not "of" 3d—was not agreed to by the Council until their meeting towards the end of July! It is interesting to turn back to the statements that were made at this meeting in support of the threepenny price. "The circumstances are special," said Mr. Heun. "The fact is the Committee are in danger of losing the consumers in competition with the Gas Company; and they think it is worth a slight reduction to retain these customers." Then Mr. German acknowledged that the proposal was necessary in order to keep pace with the Gas Company; while Alderman Carden thought the concession reasonable in face of the strenuous competition of the Gas Company. Were these statements meaningless? Was the reduction to 3d. meaningless? In view of this shop experience, had Mr. Christie proved the grounds for his recommendation before making it? Perhaps Mr. Christie will answer, as there is no obligation upon him to refer this matter to a contractor.

With a covering letter signed by Mr. A. F. Harrison, Chairman, the Electricity Publicity Committee have issued another little batch of the humdrum sort of advertising literature for which the Committee have become quite famous. Much of this literature that is bought, according to report in the electrical press, is used for filling up odd corners in store-rooms; but the prices asked for the leaflets, for use as waste paper, strikes us as being rather high. As Mr. Harrison signs the covering letter, it would be highly interesting if he would submit himself to a public examination on some of the points that appear in the literature which he fathers. In one of the circulars referring to electric heating, we see a grossly exaggerated picture referring to coal-fires. What is the good of sending to a householder what he knows to be a pictorial falsehood, unless he lives at Windy Corner, and his chimneys are ill-constructed? We are strongly in favour of displacing the coal-fire with a hygienic type of heating arrangement, the heat of which can be regulated at will; but there is no use in doing one's cause harm by misrepresentation. In another heating circular, there is a picture of a very chilly looking room, with an electric radiator in the fireplace. A lady is posturing in an arm-chair in a manner that suggests she is very cold, and her feet are quite close to the radiator. Poor thing! The reader is asked: "What shall we say of heat that can be produced without a fireplace?" The picture shows a fireplace. There are several ways of producing heat

without a fireplace in a room; but no fireplace suggests no chimney, and no chimney a very bad hygienic condition of the atmosphere, when a room is occupied and closed up on a cold winter's night. Then we are told, in a very badly composed sentence: "Electricity burns nothing, and consequently there are no fumes to vitiate or use up the air." Now will Mr. A. F. Harrison, Chairman, Mr. A. C. Cramb, Vice-Chairman, or Mr. F. J. Walker, Hon. Secretary, singly or collectively tell us whether the sentence quoted refers to gas. If so, what are the fumes? and how do the fumes "use up the air?" Of course, if the sentence had been written as intended, it would have been the gas-fire or the coal-fire that would have been charged with "using up the air," and not the fumes. Perhaps the gentlemen responsible for the circulation of this stupid statement will inform us as to what is meant by "using up the air." If we go along at the rate these wiseacres suggest that we are going, there will be a terribly big vacuum somewhere, and that very shortly. On the point of economy, even 1d. per unit, we would remind Mr. Harrison and his colleagues, is expensive for 3440 B.Th.U.

A leaflet on electric cooking gives us a view of a small part of the "Queen's Head" installation referred to in two preceding paragraphs. In one of the leaflets, the statement is found that electric cooking is hygienic. That depends, according to some electric cooking experts, upon whether the oven is ventilated, as they have a strong objection to eating meat that has been baked in a motionless atmosphere charged with vaporous products of the piece of dead animal, about which products they say there is something unpleasant. We read of other heating agents used in cooking giving off "contaminating vapours." Mr. Harrison will surely oblige us by describing the nature of these contaminating products, and in what way they contaminate. If he does not come along with an explanation, we shall be inclined to think less of him as the head of this Committee than we do at the present time. What is the good of a head of such a body who is not prepared to defend its work and statements. There is another point. The Committee still promulgate the absurdity as to "meat" cooked by coal or gas losing 25 to 30 per cent. of its weight, while with electric cooking only half the quantity is lost—as vapour. All we can say is that men who know that the heat of a gas-oven can be regulated at will, that meat can be baked in it to just the degree that the cook likes, and therefore that the loss by evaporation is quite a matter of choice, and, knowing these things, make themselves responsible for the circulation of a definite statement of this kind, are not doing a thing that is creditable to themselves even in the prosecution of a commercial cause. Let them come out into the open and give their proofs, and not continue to play a part which, in our school days, would have received a description which cuts to the quick even a school boy.

Honorary Degrees by the University of Leeds.

On the occasion of the conferring of the Honorary Degree of Doctor of Science by the University of Leeds upon Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. Thomas Newbigging last Thursday (of which an account appears elsewhere), five members of the Iron and Steel Institute, the annual conference of which was being held in Leeds at the time, and others, had honorary degrees conferred upon them, in recognition of their services to science and education in Yorkshire. The following is the list: Doctor of Laws—Mr. Arthur Cooper, M.I.Mech.E., Mrs. R. W. Eddison, Mr. W. E. Garforth, LL.D., Rev. W. Hulton Keeling, M.A., and Sir Swire Smith. Doctor of Science—M. Adolphe Greiner, Sir R. A. Hadfield, D.Met., F.R.S., M.Inst.C.E., M.I.Mech.E., Herr K. F. Springorum, and Mr. J. E. Stead, D.Met., F.R.S., F.I.C., F.C.S. It may be mentioned that Dr. Greiner was the pioneer in the utilization of blast-furnace and coke-oven gas for the generation of power in iron and steel works; that Dr. Stead has greatly distinguished himself by numerous investigations relating to the influence of metalloids on, and the internal structure of, iron and steel; and that Dr. Garforth has done conspicuous work in connection with explosions of coal dust. Dr. Cooper returned thanks on behalf of himself and his four colleagues on the Council of the Iron and Steel Institute; and Sir Swire Smith briefly acknowledged the honour on behalf of himself and the remaining graduates.

Removing Suspended Matter from Gases and Vapours.—Mr. H. L. Doherty, of New York, has taken out patents for the United States for apparatus for removing suspended liquid and solid matter from gases. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the apparatus consists of an open tank in which a cylinder or gasholder is supported. The cylinder has a spiral partition attached to the top; the bottom dipping into a liquid contained in the tank, and acting as a seal. The whole arrangement forms a spiral passage for the gas, which enters either at the axis of the spiral through a perforated pipe and leaves by a pipe near the periphery, or *vice versâ*. The cross-sectional area of the spiral passage is varied to suit varying quantities of gas by raising or lowering the liquid seal; this being effected by the pressure of the gas before entering and after leaving the apparatus through the intermediary of two gasholders, the motion of which operates the valves controlling the supply and discharge of liquid to the tank.

FOR THE LIGHTING SEASON.

Messrs. Falk, Stadelmann, and Co.

THE advent of the lighting season finds both makers and sellers of gas-fittings well equipped to meet the demands that are being made upon them. On investigation one finds improvements made in different directions; while the already large number of burners and fittings for the popular inverted system of incandescent lighting is continually being added to. Evidence of these facts is to be seen in articles which have appeared in the "JOURNAL" during the past few weeks; and further proof can be secured by visiting the Farringdon Road show-rooms of Messrs. Falk, Stadelmann, and Co., Limited.

Beginning with mantles, attention may be directed to the new "Veritas Adamant" loom woven inverted mantle, which possesses an advantage from the fact that, instead of being woven or knitted in tubular form, the stocking is woven in the final form of the mantle, with the result that the mantle has no pleats. It is quite smooth and even all over the surface, and thus easily becomes incandescent, particularly at the bottom, where it is needed most. To a certain extent these remarks apply also to the "Veritas Adamant" upright mantle, which is woven conically, with the result that it has no pleats at the head, and so is claimed to be more durable. The reason advanced for this is that the older types were liable to have a somewhat sharp shoulder, which had to take the whole weight of the mantle, whereas in this pattern the weight is distributed over a larger surface. A further advantage is the better incandescence which is secured at the mantle top.

Coming to the new burners, mention may first be made of the "Veritas-Intense" pattern, which is fitted with a bronzed aluminium hood. It is arranged to take an intensifying globe, with metal bayonet top fitting. An attractive china inverted fitting is the "Luceta," which is patented and registered. The chief points of this burner are an untarnishable fire-proof china gallery and a china shell deflector. It can be had with the gallery in white and gold lines, or with it all gold covered. An advantage of a fitting of this character is the ease with which it can be cleaned when necessary, by the simple process of washing. The shell revolves, and thus when the burner is placed in position one can always turn it so that the products of combustion are diverted away from the fitting. This is an advantage that will be appreciated by consumers. The all-gold covered pattern is intended

Falk, Stadelmann, and Co.'s "Luceta" China Burner.

to give the impression of being a brass fitting, with an advantage over the metal in that it retains its golden colour. For the lighting of mills, factories, &c., the firm are showing in their recently issued Incandescent Light catalogue a reflector burner for from 7 to 10 inch high-pressure lighting. The burner is strongly made, to withstand the hard wear to which it is likely to be subjected in the positions for which it is specially designed; and it is fitted with a dust protector and dust trap, and has an injector with a bayonet fitting, by means of which the burner can be lifted bodily off the pendant for cleaning. Certainly it is a very suitable burner for work-places of the kind referred to.

The list contains a wide range of swan-neck and similar burners; and there is an "Improved Veritas" bracket burner, in heavy polished brass. This is fitted with the patent spring globe-holder, and is provided with a union, which permits of screwing into position without the necessity of turning the whole of the burner round, and possibly in the operation getting the gallery out of truth. There are heavily made adapters for converting lanterns from upright to inverted lighting. They are made with and without cast Graetzin cylinder holders, and with the swan-neck

removable, to facilitate the fitting of the burner into the lantern. In the "Vesta-Veritas" series of burners (which, like others already mentioned, are of British manufacture) an improvement has been introduced by bringing the thumbscrew controlling the gas regulator practically out of the zone of the heat, so as to make it possible to adjust the burner at all times without inconvenience. There is also a set of "Vesta-Veritas" insect-proof brass burners, designed for use in tropical countries. The "Candela" incandescent burner (which, as its name implies, has somewhat the appearance of a candle) has been improved in several respects, and its efficiency has been increased; and there is a gas-igniting device for street and domestic lighting, devised with the object of doing away with the bye-pass.

It has, of course, been merely attempted here to enumerate some of the most novel features in connection with Messrs. Falk, Stadelmann, and Co.'s incandescent lighting goods. The range of burners, mantles, &c., stocked by the firm is an extremely wide one; and this remark applies also to glass ware, both for inverted and upright lighting.

THE "LIMITING-LINE" IN CARBONIZATION.

By "ALMEA."

THE question as to the temperature to which the coal in a retort should be subjected, and the extent to which the volatile constituents should be heated before leaving the retort, so as to produce the most desirable results, has, in the past, brought forth a variety of opinions, although the matter has now been fairly well threshed out by the leading authorities on carbonization who are more or less agreed upon the main principles.

There seems little doubt that, as regards the actual volume of gas produced per ton of coal, there is still some scope for increasing the figure, even with the most up-to-date means of carbonization; but, from the purely economical standpoint finality has probably already been reached, and in many cases the coal and its volatile products are being subjected to extreme temperatures which are certainly the means of increasing the volume of gas (the excess being chiefly nitrogen and hydrogen), but which, when the question is considered from a scientific point of view, are both undesirable and unprofitable.

In view of this, the writer has drawn out a carbonization chart, the object of which is to show (as far as it is possible to do so) the various occurrences which take place when the temperature of carbonization is gradually raised to what is probably the highest possible obtainable in practice with the means at present at our disposal.

Authorities on carbonization—and particularly Dr. Harold G. Colman—have frequently pointed out the inadvisability of subjecting the volatile constituents to intense radiant heat in the free space above the charge in the retort. Moreover, the same applies to the residue in the retort; for, after a certain stage, this merely continues to evolve nitrogen and small quantities of hydrogen.

The accompanying diagram, which requires little explanation, is intended to show graphically the effect of employing exceedingly high temperatures. The various stages of carbonization are traced out and the probable composition of the gas is shown as the temperature rises. By following up the spaces allotted to each constituent, it can be seen from what source the increased volume of gas is obtained, and how the more valuable constituents —*e.g.*, methane—are replaced by those of less heating and illuminating power. The lines in the chart showing the increase of permanent gas are of special interest in that they show how, at very high temperatures, the methane partly gives way to hydrogen, and that the increased volume of gas obtained is due to further quantities of hydrogen and nitrogen emanating from the coke, and also (but in a less degree) to the splitting-up of the methane and unsaturated hydrocarbons.

There are, however, two difficulties attending the drafting of a chart of this description. The first is that, in plotting the temperature ordinates, it is only possible to consider the temperature to which the charge is subjected, whereas the effect of the temperature and dimensions of the free space and the length of time which the gases remain in this space have, of course, to be more or less neglected. For instance, in the case of heavy horizontal charges the retort temperature may be exceedingly high, but the volatile products are only subjected to this for a very short time, and are, therefore, split up to a far less extent than would be the case with the same temperature and a light charge.

All such conditions necessarily alter the appearance of the chart; and, in the present case, the vertical ordinates are set down as actual retort temperatures to which the coal and residue are subjected. The charge has been considered as a moderately heavy one—*i.e.*, leaving a fairly small free space above the coal in the retort.

The second difficulty is that of setting down the volumes of the various gases to exact scale; and this is impracticable owing to the impossibility of determining the exact proportions of each individual product obtained, and owing to the fact that no two charges of coal would be likely to give precisely the same results on carbonization.

The diagram is, therefore, merely diagrammatic; but it provides a useful means of seeing at a glance the result of carbonization at various temperatures.

THE "LIMITING-LINE."

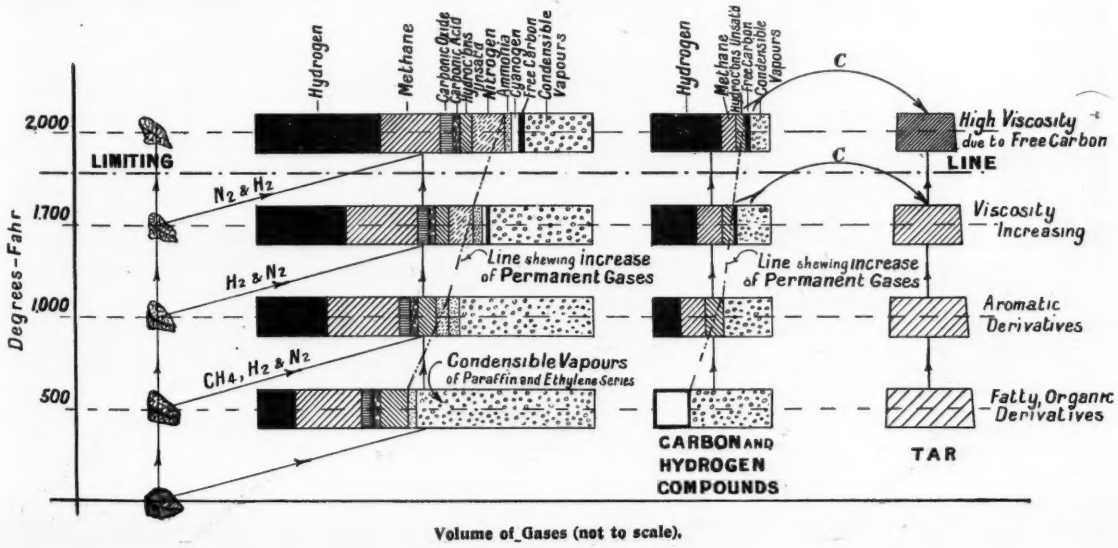
With regard to the "limiting-line," it will be noticed that this has been drawn in between the temperatures of 1750° and 2000° Fahr., and it is suggested that it is desirable to carry on carbonization up to some point in the proximity of this line. But the economical limit, is then reached, and no useful purpose is served by subjecting the residue to increased temperature. In fact, the few extra cubic feet of hydrogen and nitrogen obtained may be dearly bought. This can be best understood by referring to the portion of the diagram above the "limiting-line." Here, it will be seen that the methane is split up into its elements, hydrogen and free carbon, with the result that the quantity of the latter is considerably increased and goes partly to form retort "scurf." The remainder is deposited in the pipes and in the tar—thus rendering this product more viscous and of less commercial value. Some of the unsaturated hydrocarbons follow the same course, and the quantity of ammonia is reduced.

In fact, the only useful constituent, excluding the hydrogen, which shows any increase is the carbonic oxide. The higher the temperature the greater will be the amount of carbon dioxide reduced to carbonic oxide. But this fact, in itself, does not offer sufficient compensation for the loss of the other products. It will be seen that the amount of hydrocyanic acid is also increased at the high temperatures; this, of course, being a profitable product on works where means are provided for its extraction.

It will be noticed from the diagram that the tar is considerably reduced in quantity as the temperature rises and the viscosity gradually increases—this being largely due, as before explained, to the particles of solid carbon deposited in it.

The writer has thought it as well to show the original unsaturated hydrocarbons and their ultimate fate in a supplementary column in the diagram; for in this way it is best illustrated how they are decomposed and help to swell the volume of permanent gas obtained.

Finally, it should be pointed out that the diagram lays down no hard-and-fast formula which all coals and all systems of carbonization follow. This is far from the case; and the object of the chart is merely to afford an elementary graphical solution for an extremely complicated theory.



GLASGOW CORPORATION GAS DEPARTMENT'S STAND AT THE SMOKE ABATEMENT EXHIBITION.

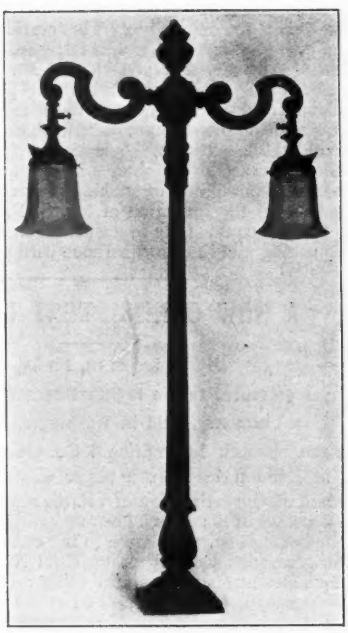
We have received from Mr. Alex. Wilson, M.Inst.C.E., the Engineer and General Manager of the Gas Department of the Glasgow Corporation, the accompanying photographs of their stand at the Smoke Abatement Exhibition which is now being held in the city. Descriptions of the gas exhibits appeared in the last and the preceding issues of the "Journal." We are pleased to learn that the attendances at the exhibition are still large, and that good business is being done.

HANDSOME AND CHASTE GAS-FITTINGS

For High and Low Pressure Inverted Burner Lighting in the Birmingham Gas Department.

THE Birmingham Corporation have recently made a large extension to the buildings in which the government of the city's affairs is conducted. The new buildings are internally very handsome, and have been designed with an eye both to purpose and the dignity of the great Midland city. The Gas Department are occupying the main portion of the building; and they have there new general offices and show-rooms, Committee room, Chairman's room, and Secretary and Manager's room, clerical offices, and store room, wherein will be discharged the work of the department, and the prosecuting of the work of business development. Naturally, the lighting of the interior of the considerable portion of the building tenanted by the Gas Department has occupied much thought both on the part of Mr. R. S. Hilton, the General Manager of the department, and the officials, and of the Architects of the building (Messrs. H. V. Ashley and Winton Newman). Gas is exclusively employed for illumination in the Gas Department's new home; and what is more by both high and low pressure gas—high-pressure gas-burners being in the parts which the public will visit when transacting business with the department. Throughout, both for high and low pressure gas, inverted gas-burners are employed; and the effect is of the kind that has to be seen to be fully appreciated.

The fittings that have been specially designed and made for the lighting are the things to which, owing to



their qualities in design and material—qualities which combine to give them an imposing distinction befitting the handsome apartments, entrance hall, and corridors in which they are situated—we desire to call particular attention in this article. Having seen specimens of the fittings at the London show-rooms (No. 26-27, Hatton Garden) of the makers, Messrs. Ingram and Kemp, Ltd., of Birmingham, we are not at all astonished to learn that pleasure and satisfaction with them are found by all who have been concerned in their production, and what is more important on the part of those who have had an opportunity of inspecting them. We do not remember having previously seen highly decorative fittings applied to high-pressure inverted lighting for interiors; but we have such fittings here in the choicest of character. The large pendant fitted with six burners of 300-candle power each (which is illustrated), is the *pièce de résistance;* and there are three of these rich pieces of work in the general offices, and all of real bronze, as are the other fittings (for high and low pressure work) to which reference has to be made presently. The length of each of these large pendants is from ceiling-level to the lowest point of the fittings some 17 feet; and the diameter from the widest points is 6 feet. It is not necessary, with the illustrations before the reader, to speak of the beauty of the design in detail, nor of the merit of the execution on the part of Messrs. Ingram and Kemp. If the smallest drop or curve of this and other of the pendants is examined, the chaste work that has been put into them is so obvious as to need no mention. One thing that is particularly striking is the silent working of the high-pressure burners.

Now we must turn to the other fittings, which, by the way, like those already described, are fitted with the Windemüller ball-joint, and with pneumatic lighting and extinguishing attachments. These are also all of real bronze. We have not illustrated every one of the patterns; but the selection made from the photographs supply illustrations of the principal, and, in fact, nearly all the, types. There is the special bowl fitting, which is much admired, and with which the source of the light is completely screened from view. These pendant bowl fittings are also of original design; and the modelling is chaste, and quite an important feature. Of these fittings, there are some six or seven high-pressure ones fitted up in the main entrance to the new building. From the main entrance, one walks immediately into the large general office, the main illumination of which is by means of the three high-pressure gas-pendants already described. Then there is the

low-pressure lighting for the desks in the general office, Committee room, Chairman's room, Secretary's and Manager's room, other offices, and store rooms. There are two-light standards fixed for desk work in the general office. The heavy cast arms will be observed. Pendants are used in the rooms of the Committee, of the Chairman, and of the Secretary and Manager; and these are of three, four, six, and eight lights. The main corridors are also lighted by bowl pendants; but these are of somewhat less imposing character from those in the entrance-hall, being *minus* the chain ornament. In the passages, bracket lights are used; the brackets standing out boldly from the walls, as may well be imagined from the illustration. High-class and decorative types of fittings for handsome interiors are not, there is demonstration here, inconsistent with high-pressure inverted burner lighting any more than with low-pressure gas lighting.

The inverted burners used have been designed in character with the rest of the fitting. Take, for instance, the low-pressure burners. The head of the burner is entirely of bronze; and the part of the fitting above the burner has been protected from discoloration by the heat and the products of combustion. The hood of the burner is lined inside with aluminium, and diverting pieces deflect the products of combustion away from the fitting. The bunsen tube is made of asbestos. The rim, forming the globe holder, is also insulated by a ring of asbestos in its upper part, and at the points where support is given to the globe, there are small pads made of asbestos. There are three effects from these last-named details: The rim is kept of good colour; the annular space formed between the globe and the rim allows a flow of cool air; and this assists in preventing the temperature of the metal rising to a high point, and in preserving the globe by keeping it from contact with the heated rim. In these burners, there is fixed adjustment, and no special gas and air regulation. It is very important that, for a permanent good appearance, the bronze should not be discoloured; and we think that against any such eyesore, effective safeguards have been made. All the burners are fitted with bye-passes; and ignition and extinguishing is performed by the pneumatic system. But here again, there are features of special interest. Instead of having the pneumatic tubes running round the arms in an unsightly fashion, both these and the bye-pass tubes are made as part of the fitting, being let into channels, so that they are not visible. This certainly adds to the neatness of the fitting. A new valve has been designed for the pneumatic system. Formerly the valves have been worked by a piston; and the effect of the gas passing round the piston has been to cause it to stick from time to time. The change that has been made has been in the provision of a little chamber with a leather diaphragm, which actuates the lever or sleeve forming the valve. By these means, no gas comes in contact with the piston; and therefore all possibility of sticking is averted. This improvement, we believe, is the invention of Mr. S. R. Barrett. The severest tests that we could apply to the arrangement by rapid lighting and extinguishing met in every instance with prompt response.

A NEW COKING TEST FOR FUELS.

By R. Lessing, Ph.D., F.C.S.

[A Paper presented to the Eighth International Congress of Applied Chemistry, held in Washington last month.]

At the Seventh International Congress of Applied Chemistry held in London in 1909, a paper was read by Professor E. J. Constam on the estimation of volatile matter in fuels, in which he gave a *résumé* of his experiences with various methods of carrying out the coking test. He came to the conclusion that the method of the American Committee on Coal Analysis gave better and more consistent results than the other methods under review; and the proposal to accept the method as the standard for the yield of coke was carried and adopted as a resolution of the Congress.

The principal advantage of this method over others formerly in use is that it carries the heating far enough to allow the employment of temperatures sufficiently high to ensure the complete carbonization of, and expulsion of volatile matter from, coal and other fuels. There are, however, a number of drawbacks which still attach to this method; and although they are known and recognized by workers in this field, their elimination has not, in spite of occasional attempts, hitherto been brought about.

The sources of error in the crucible test may be classed in two groups: (1) Factors tending to increase the "volatile" value and decrease the coke value—(*a*) burning of coke in the more or less oxidizing atmosphere; (*b*) "spitting" of coal dust due to the explosive character of gasification of some coals or rush of currents produced by the flame. (2) Factors tending to decrease the "volatile" and increase the coke value—(*a*) insufficient coking of the coal; (*b*) secondary catalytic decomposition of the volatile products on the walls of the crucible; (*c*) decomposition of volatile products by radiation in the waste space of the crucible; (*d*) deposition of carbon during coking by the too rapid primary decomposition of volatile coal substance.

It has been repeatedly pointed out by various workers that results are dependent upon the size, shape, thickness, and brightness of the walls of the crucible, as well as the atmosphere prevailing in it; and various modifications have been proposed to eliminate one or the other of these irritating factors. It can be said, however, that standardization of the method has not been reached. I venture to submit a new method, which, if not perfect in all its details, should go far in the standardization of the coking test of fuels. The *technique* of the method has been described in a paper recently read before the London Section of the Society of Chemical Industry;* and the following particulars may here be briefly recalled.

In order to do away with the drawbacks due to the waste space above the coal, and the excessive amount of heated surface and contact with the gas and vapours in the crucible test, the finely-ground sample is heated in as compact a space as possible, and out of contact with the air. For this purpose I used a cylindrical flat-bottomed tube made of quartz glass or platinum, provided with a small flange on top, by means of which it can be suspended. I have found an inner diameter of about 10 mm. to be a convenient size. One gramme of powdered coal is weighed into this tube, and a piston made of quartz glass tube or rod and loosely fitting into the outer tube is placed on top of the coal sample. By this means there is no waste space left above the coal, and the gases and vapours evolved upon heating are expelled at the greatest possible speed, and have no chance of becoming stagnant and subject to the influence of radiant or contact heat for any length of time. I have found it convenient to effect the heating by placing the test-tube into a wider tube made of quartz glass round which an electric resistance coil of platinum wire is wound. This arrangement enables me to apply the heat at any point desired, and prevent the superheating of the products of carbonization. For details as to wiring, I must refer to the paper quoted above.

The great advantages of this method lie not only in the fact that it gives an opportunity to standardize very exactly the shape and size of the reacting vessel, and to do away with the waste space above the charge; but it also permits an insight into the coking process which could not be obtained with previous methods, for the shape and aspect of the coke obtained is distinctive for every kind of coal.

The method can therefore practically be employed as one of identification of individual coals. In a paper read before the Institution of Gas Engineers,† I have shown that the method can be carried further by closing the "retort" tube and collecting the volatile products. I have been able to ascertain that the yields of gas of certain coals correspond very closely with those known to have been obtained from the same coals on the large scale.

I venture to suggest that this method should be carefully and exhaustively tested by workers in the province of fuel analysis; and, in view of the useful results obtained by the practical co-operation of members of the Sub-Committee for the Determination of Moisture in Fuels and Minerals of the International Committee on Analyses, whose exhaustive report I have the honour to present to this Congress, I beg to propose that a similar Committee be nominated for the comparative testing of methods for the estimation of volatile matter in fuels, in order to bring about standardization and uniformity of testing.

I am aware that conditions for estimating volatile matter are still more complex than those attending the moisture determination. But the results obtained in this case are encouraging enough to let us expect fruitful results; and I trust that my method will do something to further the efforts in this direction.

[The paper was accompanied by illustrations showing the difference between the coke obtained in the new and old methods.]

DESIGN AND CONSTRUCTION OF GAS-WORKS.

At a Meeting of the Junior Institution of Engineers in October last year, a paper on the above-named subject was read by Mr. George Evetts, Assoc.M.Inst.C.E.‡ It contained a great number of figures in regard to cost; but as, since the paper was written, many increases, due to various factors, have been made, the author was prompted to modify somewhat his previous data, and offer a few additional remarks on the subject. The result appears in the September part of the "Journal and Record of Transactions" of the Institution, a copy of which has been forwarded to us by the Secretary (Mr. A. Clifford Swales), who edits them for the Publications Committee. The following are some extracts from the communication.

The writer has found that castings and rolled section work has increased from 15 to 20 per cent.—dependent upon the labour involved. In retort-setting work as a whole, the prices are up 20 per cent. at least. Recent contracts for this work have been placed at from £44 to £50 per mouthpiece, against £35 to £42 given in the original paper; for a stage-floor retort-house, £34 per mouthpiece, against £24 to £32. Purifiers (set of four complete), 10 ft. by 10 ft. by 4 ft., £700 complete, compared with about £625 shown on the curve in the original paper, or £11 10s. per ton after deducting foundations. Cast-iron pipes £6 8s. per ton, against £5 12s. 6d. a year ago. In the course of a recent contract of four months' duration, ballast rose from 6s. to 8s. 3d. a load; stock bricks, from 33s. to 38s. 6d. per 1000 delivered on site; and cement, from 29s. 6d. to 33s. 6d. a ton. In this case, the large increases in

* See "Journal," Vol. CXVIII., p. 437. † *Ibid.*, Vol. CXVIII., p. 885.
‡ See "Journal," Vol. CXVI., p. 318.

the cost of ballast and bricks were due to a scarcity in the district, owing to several large contracts being carried out.

The author says there are one or two points in his paper which can be made the subject of further comment at the present time. He drew attention to the fact that it is not economical to work a portion only of the retorts in a particular arch; but he has since seen a setting of six retorts in one arch, with a centre wall, and enabling three or six to be worked at will. Naturally, the three cannot be worked with the same fuel economy as the six; but the former number is nevertheless suitable for a small works. Referring to chimney area, given as 1½ square inches per lineal foot of retort, he says it should have been pointed out that with through retorts, working with single fires, three-fourths of this amount would be sufficient. In the matter of retort-house building, several houses have recently been constructed in steel framing and 4½-inch brickwork and some with steel framing and 2½-inch plaster walls; these being reinforced with various types of expanded metal and meshing. The recent considerable increases in the sale of gas for some of the Suburban gas companies with which the writer is more or less associated emphasizes the value of planning the buildings and plant so that they are available for extensions without much destruction of existing work.

The author offers a few remarks on the disaster to the spiral-guided gasholder at Ilkeston. In the original paper he stated that he had never come in contact with a case of failure of a steel tank; and later on he ventured the opinion that there is no need to question the stability of spiral-guided gasholders, assuming, of course, that adequate precautions are taken against disaster. From the evidence adduced in this case, he says it seems fairly certain that the tank failed; and from the figures given as to thicknesses and general construction, one is led to the conclusion that the tank was not so strong as it should have been, and that, further, no extra provision was made in it for increased stresses due to the fixing of the rollers which engaged with the spiral guides. The factor of safety was a little more than 2; and in the construction Bessemer basic steel was used which was found to have rather more phosphorus in its composition than is usual. This made the metal brittle, and the actual conditions which led to failure was (in the opinion of many) a considerable variation of temperature preceding the accident. Possibly this was accelerated by some other abnormal condition; but the general conclusion is that no reflection can be cast upon the spiral-guided holder as a type; and, as far as safety is concerned, the steel tank stands exactly where it was before. In this case, the fault was that, instead of the steel tank being made stronger than when associated with an ordinary column-guided holder, it was made weaker. In the writer's practice, the factor of safety of all steel gasholder tanks is 5 to 6, or (say) a working stress of 5 to 6 tons to the square inch when erected; and all steel used is Siemens-Martin, conforming in all respects to the British standard specification.

Reinforced concrete is being used largely in gas-works on the Continent and in America for foundations, and in a lesser degree for buildings, coal-bunkers, &c. For the two first-named purposes its use is also increasing in this country; but the author's previous remarks about its employment for gasholder tanks, and similarly for tar or liquor storage reservoirs, are borne out by the fact that no further progress has been made in their adoption, and also by the fact that an eminent American writer has recently contributed to the literature on the subject, in which he confirms with emphasis previous utterances on the merit of steel tanks compared with those in concrete, plain or reinforced.*

Retort-house floors can be well and economically constructed in reinforced concrete. A thoroughly good job can be made of stage floors by keeping them absolutely detached from the bench itself. This can be effected by a subsidiary column in front of the buckstays, instead of the commoner method of supporting them off the buckstays. It is, of course, a little more expensive. When these floors are arched, a convenient method is to use thin plate or corrugated iron, instead of wooden centrings, and leave them in when the floor is completed.

In the original paper the author drew attention to the advantage of simplicity in gasholder design. A holder will shortly be erected, of 1¼ million cubic feet capacity, and, after going closely into details, the following was decided upon as the most economical form of construction: Steel tank, 140 feet diameter, 31 feet deep. Side plates varying from $\frac{5}{16}$ inch thick at top to 1 inch at bottom; bottom plates, $\frac{5}{8}$ inch inside and ½ inch outside row. Holder, in three lifts, of diameters 132 ft. 6 in., 135 ft., and 137 ft. 6 in.; guide-framing consisting of 24 standards, about 18 ft. 6 in. apart, and of H-joists, 16 in. by 6 in. by 62 lbs. horizontal girders, 10 in. by 6 in. by 42 lbs. joists, and 2 inch diagonal tie-rods. The framing in the tank for supporting the crown will be constructed of light iron, with H joist uprights, 7 in. by 4 in. by 16 lbs. radial purlins, and 7 in. by 4 in. or 6 in. by 3 in. circumferential supports. The uprights will be braced both radially and circumferentially with 1-inch or $\frac{7}{8}$-inch round tie-rods. The estimated cost, including the foundations, is nearly £13,000, against a little more than £11,000 in the curve cost accompanying the original paper. It should be pointed out that the space available in this case allowed a circle of a little more than 150 feet in diameter for the excavation limit.

Turning his attention from constructional to general matters, Mr. Evetts referred, as an incident of importance to the gas industry to the substitution of a calorific for an illuminating power standard in the South Suburban and Wandsworth Gas Acts of this session. He then alluded to the difficulty at present existing in consequence of the increased cost of coal. He said the industry is meeting this difficulty in an admirable manner, to nobody's detriment and to the public benefit, chiefly by getting more out of the coal than before, and by keeping well abreast of all the recent developments in chemical, technical, and mechanical matters. Since the adoption of machinery, the coal yields more, the same space and plant turn out more gas, and the wages per unit are less. It is rare that the introduction of labour-saving machinery means the dismissal of men. At an up-to-date works at present, the following is obtained from a ton of good coal: Gas, 11,800 to 12,800 cubic feet; coke for sale, 10½ to 11½ cwt.; tar, 11 gallons; sulphate of ammonia, 23 to 26 lbs. (obtained from 32 to 36 gallons of ammoniacal liquor). A certain proportion of the extra cost of coal is recovered in the slightly increased price of coke and higher price of tar; the rise in the price of the latter product being due to its popularity for the treatment of roads. Dehydrated and ammonia-freed tar fetches a much higher price; and it will certainly pay medium and large sized works to instal suitable plant for this purpose. The coal and transport strikes have drawn attention to the fact that, in future, gas companies must consider the matter of increased storage; and the old standard of six to eight weeks will be more likely ten to twelve in future. To all companies this will mean a large increase in dormant capital. Recent parliamentary decisions to prevent certain companies who possess sulphate plants from buying ammoniacal liquor from small neighbouring concerns will hamper the industry; and it is forming a case for stern opposition on the part of the Gas Companies' Protection Association at the present time.*

In spite, however, of these matters, but briefly touched upon, the outlook is promising. The day-load is increasing by leaps and bounds, due to the progress of gas cooking and heating; the slot meter is continuing its good work among the working classes; and co-partnership is causing companies who adopt it to get round them a loyal band of workers. With the co-partnership bonus acting in concert with the operation of the sliding-scale, we have a unique bond of interest between workman, customer, and shareholder; and could a similar scheme be operated in all industries producing the necessaries of life, we should have the most practical solution of labour difficulties. The three colliers first out of the Tyne after the coal strike were bound for the Thames to supply London with its gas, and manned by co-partners. And yet one hears of a "dying industry"! Our present state of robust health is due in a great measure to our three unromantic friends —the incandescent burner, the gas-cooker, and the slot-meter.

* See "JOURNAL," Vol. CXVIII., p. 368.

VALUE OF SULPHATE OF AMMONIA TO CROPS.

THE Government Department of Agriculture and Technical Instruction of Ireland have been carrying out tests with four nitrogenous manures. Hitherto the main supply of nitrogen from artificial sources for farm crops has been derived from sulphate of ammonia and nitrate of soda. Recently, however, two others —viz., calcium cyanamide and nitrate of lime—have been placed on the market. With a view to comparing the relative manurial value of these four manures for different crops, a series of experiments has been conducted during the past three years. In every case the cultivation of the plots was the same, and the only varying factor in the manures was the source of nitrogen. Approximately an equal quantity of nitrogen was applied to each plot; the nitrogen contained in 1 cwt. of sulphate of ammonia being taken as the standard. The manures were applied in the ordinary way at the time of sowing the seed, except in the case of nitrate of soda and nitrate of lime; and these were applied as a top-dressing when the plants were well above ground.

The guaranteed percentages of nitrogen in the manures used at most of the centres were as follows:—

	Per Cent.
Sulphate of ammonia	19·75
Nitrate of soda	15·50
,, ,, lime	13·00
Calcium cyanamide (nitrolim)	18·00

To ensure accuracy, the last two were supplied by the department, who found that the calcium cyanamide they provided, though only guaranteed 18 per cent., contained actually 19·6 per cent. As the percentages of nitrogen in sulphate of ammonia and calcium cyanamide were practically equal, similar quantities of these two were used throughout the experiments. The results with various crops per statute acre are summarized as follows. They represent separate experiments with the four nitrogenous manures, and a similar plot with no nitrogenous manure.

Oats.—All the plots at each of the eight centres were dressed with superphosphate and kainit, in addition to the nitrogenous manures. The average yield of grain and straw from plots dressed with sulphate of ammonia, nitrate of soda, and nitrate of lime respectively, is practically the same. The lowest yield, both in respect of grain and of straw, was produced by calcium cyanamide.

Potatoes.—At each of the fourteen centres the crop received a dressing of superphosphate and muriate of potash in conjunction with dung. The average results show but slight variations in

* In a foot-note the author explains that since the last remarks were written the House of Commons have decided to refer the whole matter to a Joint Committee.

yield, except in the case of the nitrate of lime plot, which were considerably lower than those from the other manures. This result from nitrate of lime does not confirm the average returns of previous years.

Turnips.—The advantages here of nitrogenous manures were not marked; but, as in the two previous years, a yield slightly the heaviest was obtained from the use of nitrate of soda.

Mangels.—The yield from the nitrate of lime plot in 1911 was 64 cwt.—nearly equal to 10 per cent. below that of the others, which were practically equal. In previous years, the nitrate of lime gave results quite equal to other nitrogenous manures.

Calcium cyanamide, as sold commercially, is a very fine powder. This powder is difficult and unpleasant to sow by hand; and it has been suggested that, where it is intended to apply a mixture of artificials, the disadvantages attending the use of the manure could be obviated if it were compounded with phosphatic and potassic manures, as is done with sulphate of ammonia. In order to ascertain whether the efficacy of the calcium cyanamide or the other ingredients would thus be adversely affected, an additional plot treated with such a mixture was included for the four crops under review. The extra plot, in the case of each crop, was dressed with a specially-prepared calcium cyanamide compound identical with the department's standard formula for that crop, except that calcium cyanamide replaced sulphate of ammonia. Thus in the case of oats the two manurial mixtures applied were made up of 3 cwt. superphosphate (35 per cent. quality), 3 cwt. of kainit, and (*a*) 1 cwt. of sulphate of ammonia or (*b*) 1 cwt. calcium cyanamide. Each mixture was applied at the rate of 7 cwt. per statute acre. The tests on potatoes, turnips, and mangels were carried out on the same principle.

The average yield from the plots dressed with the calcium cyanamide mixtures was in every instance somewhat less than that from the corresponding plot treated with the standard mixtures. Indeed, with one exception (the nitrate of lime plot in the potato experiment), the returns from the calcium cyanamide mixtures were the lowest obtained from any of the nitrogenous applications. As in some respects the 1911 results are not in accord with those of the years 1909 and 1910, further experiments will require to be carried out before a definite opinion can be expressed as to the relative value of these manures.

Nitrate of lime is usually delivered in casks; if exposed to the air, it absorbs moisture and quickly becomes wet and pasty, or even liquid in form. It is not, therefore, suitable for mixing with other manures. This is a serious disadvantage in the use of the manure. Nitrate of lime and calcium cyanamide should be stored in a dry place.

In the department's memo. A.B. No. 8, the following manures are recommended for the various farm crops:

For oats or barley, the standard mixture given above, which, containing sulphate of ammonia, forms a complete manure, having an analysis of 2·75 per cent. of nitrogen, 15 per cent. of soluble phosphates, and 5 per cent. of potash. To be applied at the rate of 5 cwt. per statute acre.

For potatoes, a mixture of 1 part of sulphate of ammonia, 4 parts of superphosphate, and 1 part of muriate of potash, which forms a complete manure, of 3·25 per cent. of nitrogen, 23 per cent. of soluble phosphates, and 8 per cent. of potash. To be applied at the rate of 5 cwt. per statute acre, along with 15 tons of dung.

For turnips, where the amount of dung is very limited, the following mixture should be applied, 5 to 6 cwt. per statute acre: The standard mixture as above for oats, *plus* 1 part of superphosphate, equal to 2·5 per cent. of nitrogen, 17·5 per cent. of soluble phosphates, and 4·5 per cent. of potash.

In a manurial test on mangels over a period of six years, it was found that benefit resulted from the inclusion of common salt in lieu of kainit. This was particularly so when sulphate of ammonia is used instead of nitrate of soda. As to the relative value of the two nitrogen sources just mentioned, when employed in these manurial combinations, the average profit over the whole period is practically identical. In an average season, therefore, sulphate of ammonia appears to be preferable to nitrate of soda, as less labour is involved in its application.

In 1908, another set of tests on mangels was commenced; and in 1911 this was continued on 28 farms in 18 counties. Details of the crop results and manure costs are given, concluding with the following summary. Farmers, therefore, may rely upon the mixture of artificial manures which has in former years been recommended as quite suitable for mangel crops when supplemented with a liberal dressing of dung. The mixture is: 4 cwt. of superphosphate, 2 cwt. of sulphate of ammonia, 4 cwt. of salt per statute acre.

Experiments upon the growth of flax, as affected by various mixtures of muriate of potash and sulphate of ammonia, showed satisfactory results, in marked contrast to the use of superphosphates and steamed bone flour, which were found to be injurious. The following summary shows the profit per statute acre resulting from the use of the several mixtures—"A" standing for muriate of potash and "B" for sulphate of ammonia. The weights of crop given are scutched flax per statute acre.

Taking the average figures in this table and comparing them with the monetary returns where the manure was muriate of potash alone—viz., £2 0s. 10d. profit per acre—bears out last season's results, in which, however, the increased margin of profit left through the use of sulphate of ammonia was not so great or so regular. The results, as above recorded, tend to show that the addition of sulphate of ammonia to the usual potash manures for flax would prove remunerative, especially on poor, light soils; but further tests must be carried out before thoroughly reliable conclusions can be drawn.

Conditions of Growth of Flax.	A	B	Flax per Acre.	Increased Crop by Use of Manure.	Net Profit by Use of Manure.	Increased Profit over Muriate of Potash Alone.	
						Year 1909.	Year 1910.
	Cwt.	Cwt.	Lbs.	Lbs.	£ s. d.	s. d.	s. d.
Unmanured plot . . .	—	—	447	—	—	—	—
Manurial mixture applied	½	½	532	85	2 13 0	4 0	12 2
,, ,, ,,	1	½	537	90	2 16 9	7 0	15 11
,, ,, ,,	1	½	546	95	2 17 8	3 10 loss	16 10

The department are conducting experiments in the growing of sugar beet, and are using as the artificial manures mixtures of kainit, superphosphate, and sulphate of ammonia, supplemented under certain special conditions with small dressings of nitrate of soda.

FITTING GAS AND COAL FIRE-GRATES.

WRITING in reference to the article on "Gas-Fire and Coal-Fire Grates" in the "JOURNAL" for the 17th ult., a consulting gas engineer who has given considerable attention to the subject expresses his pleasure in noting that at last something is being done in order to supplant what he characterizes as the "hideous arrangements" which have hitherto been the fashion in gas-fires. He points out that in an article in the "JOURNAL" for March 8, 1910, the subject of "Fitting Gas-Fires in Houses" was dealt with; and while he acknowledges that what is now being done is a step in the right direction, he says it is only a step. In the course of that article, it was remarked that there was room for improvement in preparing houses for the reception of gas-fires. At present, when these are introduced into a house they do not look as if they belonged to it, and, as a rule, are either put into a fender in front of an existing grate, or fixed inside the grate-bars. It was suggested that the open grate and mantelpiece arrangement should be discarded, and "everything designed to fit in with the requirements of the gas-fire only."

Our correspondent recognizes that it is difficult to get architects and builders to abandon the old-fashioned fireplaces and the big chimneys to bedrooms; but he holds the belief that the day will come when these things will be relics of the past. In connection with this subject, he encloses an extract from a letter he lately addressed to the chairman of a company, urging upon the proprietors of a very large building estate, just started, to pay more attention to the proper introduction of gas-fires. In the course of the letter, he said:

> I would strongly urge the desirability of all houses being piped and properly prepared for gas supply at the time of building, particularly with respect to the fitting-up of gas-stoves and gas-fires and hot-water apparatus, whether for bath or other use. Up to now, architects have practically ignored provision for gas-fires; they are always introduced as obvious after-thoughts—the pipes and fittings being brought up through the floor and over hearths in a most crude manner, whereas a well-designed brass standard with tap is all that should be visible above the hearth, to which a gas-fire can be connected when required. This could be so arranged as to be no disfigurement. Another point may be worth notice. Instead of ordinary coal fireplaces with big chimneys for bedrooms, why not introduce specially designed recesses and gas-fires with small chimneys to carry off the fumes? This would be an obvious saving in building, much cleaner in use, and save all chimney sweeping, &c.; and, further, it could be made an attractive architectural feature, instead of, as it too often is, an ugly appendage. To pipe houses after they are completed and decorated is an obvious mistake. It is not only more expensive, but may be a disfigurement.

In his letter, the writer mentioned the name of a gentleman who, in his opinion, was specially suitable to inaugurate a new system such as the one he suggested, having "the energy and ready ability needed to bring it about." He suggested that if the person named had any idea of introducing the convenience of gas on the estate, if only for heating and cooking purposes, he should pipe the houses as he built them. If not, there would be greater difficulty afterwards in persuading the occupiers to take gas.

The "Co-Partnership Journal" of the South Metropolitan Gas Company for the present month reached most of its readers on the fourth anniversary of the death of Sir George Livesey, of whom the Editor wrote as follows: "The value of his life-work, especially of the work of his later years, is more than ever evident, even to those who do not always associate the work with the name of the worker. The co-partnership movement among gas companies, as initiated by Sir George, is the most vigorous and successful of the applications of co-partnership to industry and commerce. Gas co-partnership has never failed; and when we remember that every scheme is a more or less complete application of the Livesey rules and principles—that in no case have they been improved upon, and in most cases they have not been fully applied—we get some idea of the genius which evolved, and for twenty years patiently elaborated, the details of the pioneer scheme."

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Wallsend.

The Seventy-First Half-Yearly Meeting of the Association was held last Saturday, at the offices of the Walker and Wallsend Union Gas Company, Wallsend. The members were met at the Central Station, Newcastle, by the President of the Association, Mr. CHARLES H. ARMSTRONG, the Secretary of the Company, and proceeded to Wallsend in reserved tramcars of the Newcastle Corporation. The President welcomed the members, and expressed his pleasure at seeing so many present.

WELCOME BY THE GAS COMPANY.

Mr. C. J. POTTER, the Chairman of the Walker and Wallsend Gas Company, cordially welcomed the members. He remarked that if the Company was not a large one, it had a large amount of room to accommodate a meeting such as that of the North of England Gas Managers' Association; and he thought the members would be pleased with the works, which were modern. They invited criticism; and if the visitors could give them a "tip" or two, perhaps it would do a great deal of good. Although he was not a member of the Association, he had many old friends who were members—Mr. Ford, Mr. Hepworth, and others who he was pleased to see were present. The coal strike had caused a most trying and anxious time for the gas industry, and he thought it must have added years to the age of many of them. He hoped such a state of things would not occur again in their time.

THE LATE MR. H. J. DAVIS.

The PRESIDENT said he regretted to have to sound a note of sorrow. He alluded to the death of Mr. H. J. Davis, of London, of gas-stove fame—a well-known and esteemed figure in the gas world. The bright and genial disposition of the deceased gentleman appealed to all with whom he came in contact. The Hon. Secretary of the Association (Mr. Herbert Lees, of Hexham) had already sent a letter of sympathy and condolence to the relatives of Mr. Davis.

THE LEEDS UNIVERSITY DEGREES FOR GAS ENGINEERS.

Mr. JOSEPH HEPWORTH (Edinburgh) said he had great pleasure in proposing a resolution which he knew would be carried without a single dissentient. They were all agreeably surprised to learn that the Leeds University had recognized the outstanding ability of three gentlemen in the gas profession, and upon these it had conferred the distinction of Doctor of Science. He referred, of course, to Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. Thomas Newbigging; and he proposed: "That this meeting desires to offer its hearty congratulations to Mr. Corbet Woodall, Mr. Charles Carpenter, and Mr. Thomas Newbigging on the degree of Doctor of Science conferred upon them by the University of Leeds on Thursday last—a distinction which will be highly appreciated by the gas industry throughout the country."

Mr. HENRY TOBEY (Malton), in seconding the proposition, remarked that each of the gentlemen mentioned was well known in the gas profession. They were leading lights in it, and had advanced the cause of the gas industry very considerably in various ways. The degrees conferred were a reflected honour on the gas institutions of the country; and the congratulations of the Association were heartily extended to the gentlemen named.

The resolution was cordially passed.

APOLOGIES FOR ABSENCE.

The HON. SECRETARY read letters of apology from Dr. Corbet Woodall, Mr. Doig Gibb, Mr. David Terrace (who was prevented from attending through indisposition), Mr. Samuel Glover, President of the Manchester District Institution of Gas Engineers, and others.

NEW MEMBERS.

The following candidates for membership were presented and accepted: Mr. Walter Livesey Robertshaw, of Sunderland; Mr. Percy M. Gledhill, of Kerbymoorside; Mr. Fred. Young, of Brampton; and Mr. Thomas M. Gledhill, of Filey.

REVISION OF THE RULES.

The HON. SECRETARY gave notice that at the next meeting of the Association he would submit proposals for the revision of the rules.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—The honour of holding the office of President is one I appreciate very highly indeed, seeing that it is fifteen years since a secretary (solely such) was elected. The requirements of the position engendered doubts as to my suitableness, in the knowledge that the standing of the majority of my predecessors was more in touch with, and still more appropriate in fulfilling, the objects of the Association—viz., "the advancement of gas engineering, and the encouragement of discussion of all matters connected with the manufacture and distribution of gas and its products." The President's address should the more secure appreciation, in a retrospect of the practical innovations by which the industry has flourished to its present position, and a consideration of ways and means towards a sound continuity in the future. I could not hope, therefore, that remarks upon secretarial work in general would have sufficient interest to the majority here. What might be of wide interest to members of the "Chartered Institute of Secretaries" could not be expected to have the same appropriateness or weight with you. I venture to think, however, that my duty might be somewhat accomplished in providing sufficient allusive interest in the light of the observant.

DEVELOPMENT OF THE GAS INDUSTRY.

It is a laboursome process to trace from original sources the development of our industry; to study in detail the art and science by which practices from the earliest beginnings have been revolutionized. It is not my purpose to recapitulate what we owe to the old standards in gas enterprise for the sound position of the practical side of the industry to-day; but it is desirable to consider the lessons due from their achievements. They had not the advantages of scientific knowledge as known to us—having had to rely more upon their own experience and self-effort. The modern improvements and benefits resulting we owe to no little extent to their enterprise and ingenuity; and these remind us of what we owe to their practical ardour and foresight, and teach us that every discovery has been a factor of value to the industry, enabling each succeeding generation to be the better fitted to compass and produce changes towards skilful advancement. It is observable that in the ranks of the gas industry there is no organized hall-mark of merit; yet the magnitude and strength of the industry warrant some tangible distinction, without having to look to other institutions for it.

Although history records what has been beneficially accomplished, it also reveals the lapses of original schemes which might have been the better continued; and it is well to observe the course of those which have not altogether culminated in success. These schemes should not be allowed to drift, but should be kept in mind until a fitter opportunity arises. It should always be one's aim to maintain and prosecute any original scheme or idea promising success, towards ultimate accomplishment, by adaptation to the new conditions. It is said usance begets indifference; but this cannot be said in an inventive sense. The genius of invention is potent and varied in its usefulness. One should display vigilance and strive seduously after his ideal, endeavouring to work out his theories by practical means, jotting down and fostering any note of usefulness, however incomplete. The search into and the study of old opinions are incentives to originality, often resulting in the evolution of ingenious devices. The inventive faculty is essential to progress, and it behoves all to cultivate it.

EXAMINATION AND VALUE OF ORGANIZATION.

It is important to examine our industry, with the view of thoroughly ascertaining whether it is progressing as it ought, and showing sufficient prosperity as indicated in the results, having regard to the conditions under which it is growing. The need of binding together to forward welfare in common is now widespread and universally acknowledged. Various industries are represented by organized institutions for professional work—restrictive and otherwise. A greater measure of success in any industry must accrue from organization. The spirit of inquiry is sharpening-up. It is becoming more needful to decide upon matters promptly. Every question, every contingency connected with it, must be considered to a finality as rapidly as possible, which denotes a necessity for widely detailed and general knowledge, to be gained only by the binding together of the units into some organized association. There is generous and liberal consideration in the combination of interests for mutual benefit. Practical experience alone cannot afford all that is required. Although the trend of present development is specialization, there must be a close and distinct blending of the various elements—commercial, financial, productive, and supply, the grasp of the relative bearing of one upon all being indispensable, not only in one's own undertaking, but with the industry at large.

Professional status in the many callings of life may be measured out to each representative by individual achievements; but to no little extent must it be recognized something is due to fellowship. The success of any association does not rest mainly with the member, but with the body as a whole; while a broad and unrestricted membership conduces more effectively towards that success, by bringing together a more general volume of detail opinion from competent practical service. The main interest of an association, as incorporated with the immediate welfare of the industry, is to quicken the effectual force and agency of its units. The qualification should be that of competency in one's own branch of the industry, approved by service and examination. I do not suggest that any organization is perfect. Advantages, though prevalent, are oft-times inseparable from defects. If systems had a continuity of marked perfection, we should never have had geniuses whose attainments evolved from the defects of others. The object of every association is universal progress, as well as special professional improvement. This fact should be acknowledged and encouraged for the ultimate well-being of the whole community interested. The manager and secretary

are very much indebted to the industry for all that which makes for incentive and effort, and are somewhat in honour bound to acknowledge the debt, by some service for the privileges enjoyed. Efficiency of its members is, perhaps, the highest characteristic of an association, and from a natural tendency to interest proceeds a desirability that rules may be modified and extended as the changes of time and progress warrant. I feel conscious that every association by a policy of broad and universal membership enhances its success, and thereby reaches a higher ideal of usefulness; while, on the other hand, an exclusive and restrictive attitude retards in some measure the very fulfilment of its objects. The purposes of this Association are of widespread interest. It is progressing in the right direction by showing no desire or tendency to dominate in its action. It has opened out in a manner productive of great good to its members in general—a contributing factor to this being its broader membership than other kindred associations, with the recognition of controlling influence for the joint benefit of the industry in general.

COMPETITION.

Our predecessors, in a more easy-going past, had not to meet the competition and stress before us to-day. With the new conditions, it is evident that the industry cannot hope to flourish sitting tight, as it were, on its past reputation. Every succeeding year affords proof of a growing commercial interest, matters thereto being now studied as diligently as any of the sciences, and as fruitful in results to the industry generally as the adoption of constructive proposals. It is necessary to fortify our exertions for the maintenance and the continuity of prosperity, by every possible method of activity. Thus, it is of great importance that officials should make full use of the opportunities afforded them. Superficial knowledge is becoming a thing of the past. The members of the technical staff should look to something more than mere technical and mechanical practice. They have much to learn from the commercial staff, just as the members of the commercial staff have much to learn from them. Technical acquirement is not altogether an effective agent for meeting the competitive equipments set against us. Commercial knowledge may now be considered as the keystone of business progress; and in every department of the gas industry it should be advocated. Each unit of our Association has equality of opportunity as a member of the Special Purposes Section, which may be appreciated as a valuable aid to fitness, to the advantage of all concerned as well as to the industry they serve. Problems arise that need a process of reasoning which can only be determined by immediate comparison with similar examples and illustrations. Our sectional organization is of unquestionable value and complete in this respect—being brimful of capable practical evidence, embracing routine work from the lowest grade to the highest work of administration.

Public confidence in every enterprise is important to its welfare. This cannot be won without voluntary practice, and every opportunity to educate and demonstrate the soundness of things by tangible facts, testifying to successful uses, should be seized. The competition of the industry with its great rival—electricity—gives a spur in this direction. Observation by way of demonstrations tends to successful issues, and at the same time invites a healthy competition, which, if not responded to in a similar spirit, goes to prove that the unwilling competitor is inferentially unable to hold his ground. Contact invariably leads to a better appreciation, which may be converted to sincere and sound conviction. The passport to the public is accuracy of statement, aiming purely at a legitimate success which would justify itself and merit commendation. There should be a very strong feeling of comradeship among the various links of the industry to assure an effective militant force to combat our competitors. The whole industry is at last becoming wide awake to the need for closing its ranks, and the concentrated action gives invaluable aid. We are gainers by the ingenuity of the manufacturers of gas appliances; therefore we must need co-operate in their achievements, recognizing in every direction their efforts to render success. The wants of the public are the more satisfied by giving the best facilities for observing the methods of use, and the most effective agent thereto appears in demonstrative exhibitions by the combination of traders and undertakings.

SOUND AND CAPABLE ADMINISTRATION.

The credit of all commercial concerns depends, to no small extent, upon a sound and capable administration. Where boards and committees are of the highest character, bringing practical experience, business acumen, and professional ability to their judgment, it may be fairly said the financial and commercial security of the enterprise is enhanced. Success in this direction is evident by the financial prestige shown in the confidence and respect in which gas securities are recognized—a most effective element you must admit towards successful progress and development; by the fostering of all schemes of special, general, or public improvement, manufacturing and distributive—for it follows that if the staple industries do not flourish, one's own must suffer; and by commercial co-operation with, and complete confidence in, their staff, the recognition of their worth, and the granting of facilities whereby they may confer with others for mutual benefit, fully alive to their ability to keep abreast of the times. The responsibility of boards and committees thereto is evident. They must necessarily rely upon their staff for information, giving their guidance and judgment upon what is tendered.

In all industries that of the secretary carries with it a high ideal of usefulness. The greatest interests and affairs of the undertaking are entrusted to his care, carrying duties which are manifold—too numerous in this address to go over in detail. With a growing desire for competent engineers, so it is now with secretaries. The question of eligibility is now fully recognized by a Chartered Institute of Secretaries. Their responsibilities are rapidly growing, requiring great care and caution to be exercised in the discharge of their duties. To the gas secretary, the qualifications are not in any wide respect really different from those of other industries. Primary education is necessary, a secondary and professional training is expedient, together with experience gained in the industry. To those seeking eligibility, the training must be upon organized methods; and, to enhance his status, he should qualify himself as early as maybe for membership of the Chartered Institute, ensuring as it were a safe conduct for consideration. The qualification, however, is not thereby altogether complete. A prosperous termination lies in thorough commercial training and initiative. Conscious of the responsibilities and requirements, his duty lies in the endeavour to develop himself by widening his commercial knowledge, to enable him to conduct operations in as intelligent and serviceable a manner as possible. At the same time, steadiness is requisite, based on the confidence in himself which renders him independent of indifferently following the lead of others. Towards developing the power of mind by which perfection is approached, I might quote the words of Bacon, "Reading maketh a full man, conference a ready man, and writing an exact man"—a wise precept for adoption.

EDUCATION AND TRAINING.

It is now fully recognized that a technical pupil, or student of the gas industry, should be very largely familiarized with the practical side, so that the mind might the more readily conceive the correlation of things; that by a continuity of useful practice he would gain the more, and tend to develop on lines enabling him to grasp conclusions more or less serviceable to his bent. The wider culture of education—scientific, as well as the practical and technical—must be admitted as really essential to the budding gas manager. His primary or fundamental education must be adequate, at the same time directed towards those higher arts and requirements useful to his purpose and success in life. Can it seriously be determined what are the necessities that have to be met at the present moment? Conditions are ever changing and the best method to be pursued is debatable. It is observable that he is expected to be a competent engineer. His accomplishments, however, must cover more than the technical side of things. The specialist cannot be sufficiently up in all necessary generalities to give thorough attention to all the branches of an undertaking, and so he cannot hope to advance with an equal confidence.

The relations of one department to another are so inwardly blended that nothing in the organization or regulation of a staff deserves to be treated with more consideration than personal combination. Bearing in mind the overlapping of the respective duties, I would respectfully recommend the secretary and the engineer to be part of all they are in touch with. It is not only with the secretary and engineer this should apply, but with the whole staff. Every rank must be expected to give an appropriate and an all-round share of attention. A general exchange in all departments promotes personal fellowship, drawing attention to anomalies or features for internal improvement in all the elements making up the business, brings influence to bear upon one and all, as one department looking well over what is its own concern creates a spirit of emulation in the others, fosters individual initiative throughout, and establishes by close relationship a combination of mutual interests. The training of a secretary or engineer may develop business ability indispensable to his position, but it does not cover all that is required to secure recognized competency. Goodwill is only won by a prudent display of tact which enters into all phases of business life, and which cannot be taught in the sense of acquired training. It is here where example may be followed by means of intercourse with, and the study and emulation of, attractive personalities. The urgency and spirit of the age leave no time for any slackness. One must mould himself into something tangible, shaping himself for sale in the modern market, with a fair probability of finding a purchaser for his qualities. A gauge of intellectual strength is memory, which can only be acquired by earnest attention, and may be stimulated by intercommunication and transference of knowledge. Where the pursuit in life is a forced one, lack of interest is often evident; thus the welfare of the industry suffers as well as that of the man. Industries can only thrive by the regular and wide diffusion of well-trained intelligence; and there is no place in any industry for those neglectful or lacking sufficient energy and intelligence to carry through a task. I do not say that we must always look for perfection; but we must not tolerate indifference where it is personally observable. Defects in a system are different; they may be remedied, and the system improved by the intelligent efforts of those really interested in its success.

A feature in almost every sphere of industrial activity is the recognition of the need of the aid of scientific education for its maintenance and furtherance. The opinions of several educationalists—representatives of various types of culture—are now sufficiently broad to recognize the advantages of science interwoven with practical and constructive enterprise. University

training is highly valued; but it is in the more up-to-date propaganda that its worth is most fully realized. No doubt, Universities in the past considered it no part of their practice to propagate their discoveries. Their main object was to give a foundation for extant knowledge, to enable the students to enlarge upon it in the various pursuits to which they were called. Scientific knowledge is not a faculty or a gift—it must be acquired; and given the best of improvable conditions it is unmeasurable to the perfection of things. Many of our modern improvements are primarily due to scientific investigation, and—I think that I am right in saying—we believe science points out the direction improvements will take in the future. It prepares the mind for skilful management, gives ability to produce changes, and enables engineers to successfully promote discovery and overcome the difficulties confronting them. Step by step it has advanced to a practical application of its discoveries to useful conclusions, and, therefore, takes a natural position in the problems of the times. It is well, therefore, for the youth of the gas industry to undergo the toil of special training, in order to secure the foundation to better adapt themselves to the competition of the times. Preferment is not altogether by way of influence, nor yet a battle of wits. The essential factor towards an assured position is where full effect can be shown by a perfect system of training. The old adage should ever be borne in mind:

" 'Tis not in mortals to command success;
But we'll do more . . . we'll deserve it."

The opportunity for the attainment of recognized professional knowledge is necessary. This is partially met in the gas industry by way of occasional lectures, classes, guilds, &c., more specially applicable to the rank and file. But the progress of time and change opens out what has been considered as a higher scale of attainment, in the degrees and diplomas in gas engineering at the Leeds University, the training of which is not offered as an experiment. And when we remember the great amount of training necessary for the foundation of an engineer, however specialized, the movement deserves a greater measure of recognition than it at present receives. Reflections have been cast upon the movement that there has not arisen any great desire on the part of the gas fraternity to avail themselves of the privileges. One might quote that the gas industry owes to science the recognition that a great part of its modern developments have arisen from the primary investigations of well-known scientists; and one should imagine that the best way to recognize the advantages of the past is to appreciate the possible advantages accruing from a more intimate collaboration in the present and future.

The progress made in commercial education shows important advancement towards the meeting of the up-to-date business requirements of trade and enterprise. The older Universities, in adhering to their academic and classical curricula, fail to meet the requirements of the great army of workers who, looking to commerce for a livelihood, need instruction and teaching of a relative character. The newer Universities, however, are recognizing the future needs appertaining to active commercial life, by formulating instruction pertinent to a student's future calling, thus enabling him to gather knowledge early in life, and stimulating and developing his creative powers towards accomplishing his purpose. Business men do not, as a rule, send their sons to the older, but incline more to the modern, Universities, with the practical element towards professional and commercial status.

Turning now from the abstract to the concrete, there are a few matters of general interest to which I should like to refer.

DEPRECIATION AND INCOME TAX.

In 1908, I read a paper before you, upon "Depreciation and Kindred Matters," which indicated a relative basis of principle for depreciation affecting gross profits. This gave rise to an important bearing in account for income-tax purposes, the position of which it was at first my desire to review somewhat broadly. But the recent negotiations of the Committee appointed by sundry gas companies and of others have greatly lessened my design. However, I think I might illustrate with some little interest what arose previously with my Company—in which we had the aid and advice of the Machinery Users' Association—bearing on two important claims for an allowance upon the cost of replacing obsolete plant and machinery, and with respect to an annual wasting allowance. There appears to be no legal obligation on the authorities' part to admit any claim for allowance on obsolescence. However, a just and reasonable claim was instanced by concrete facts and figures, and favourable consideration was granted. The basis of claim was old worn-out dismantled plant, physically unfit for pressing needs and requirements. The authorities decide for themselves the definition of "plant and machinery," and create a distinction in a very marked manner. The two words being used in conjunction imply a connection of operation; but the authorities draw a line of distinction, in the sense that the word "machinery" is quite explanatory in itself, and the word "plant" denotes appurtenances, boilers, and other fixed structural ironwork—declining buildings, concrete and brick constructions, ground work, wells, valves and connections, and foundations. In carbonizing plant, the brickwork is excluded, as also are foundations for engines, boilers, and all other fixed apparatus. The definition of what is "plant" is an important point at issue, and the limitation to structural ironwork is debatable. The use of the word "plant" in conjunction with "machinery" indicates a physical connection; and it is only the total construction of ironwork, concrete materials, and connections, that make the plant a working whole. The aggregate allowance granted was practically the full value of the authorities' definition of what is "plant and machinery." The computation for repayment was at the current tax, and divided over two years.

The proper procedure for income-tax purposes is by way of annual allowance, seeing that, during the progress of the claim for obsolescence, it transpired each year was complete in itself—retrospective allowance only being acknowledged by way of concession. It cannot be to the best interests of a gas undertaking to forego any legal rights possessed, for what can only be considered an act of grace, and especially so, as it transpired, should unforseen conditions arise to change the character of the replacement, it might bring with it a refusal by the authorities to recognize the new type of renewal as a replacement of the old. It was this position of matters my Directors took exception to, and thought that if the Company had the legal right, by the Customs and Inland Revenue Act, 1878, to claim reasonable allowance, as representing diminished value by reason of wear and tear during the year, and in accordance with the Finance Act, 1907, to be included in the annual statement required to be delivered, it should be arranged forthwith. Hence the claim for annual allowance. This claim was settled upon a basis of a fair life interest, for which I submitted complete detailed lists of the total new works capital expenditure, eliminating any assets where structural value could be maintained by ordinary methods of annual repair. After the nature of wasting assets is determined, the life factors have an important bearing upon the allowance. Many of the life percentages were agreed to, others being left on appeal to the District Commissioners, who decided upon aggregate allowances on bases of 6 per cent. and 3 per cent., equalling about 4½ per cent. overheads to be continued upon the writing-down system. During negotiations we particularly emphasized the uses and operations of gas apparatus, which were appreciated by the local surveyor, who took the trouble to visit the works to see the machinery and plant *in situ* and under operation.

POOR RATE ASSESSMENTS.

I wish to identify myself with the observations of my predecessor Mr. Tobey, upon the present so-called principles in regard to poor rate assessments. The process pursued gives rise to numerous contentions; and it is in them where difficulties occur. Results, when all is said and done, are simply manipulated estimates, and when mutually agreed to may be considered only tentative compromises. A leading point in dispute with rating authorities is that of tenants' capital, which gives rise to a great deal of controversy; and, notwithstanding the High Courts decision that meters, stoves, fittings. &c., be included as tenants' capital, it will still continue to do so. A couple of years ago, following the erection of our new works at Howdon Lane, we fell into dispute with the rating authorities regarding a fresh assessment, which was, after much argument and contention, compromised under what might be considered a reasonable arrangement. Previous to compromising, and following precisely the lead of well-known systems, a factor in the schedule with regard to tenants' capital stood out very prominently indeed. The Company's area being solely an industrial one, the advent of electricity proved very costly to the Company by way of expenditure in tenants' capital in order to regain the partial loss of the manufacturers' supply. Now assume circumstances had arisen wherein the cost had been doubled, the fact stands out that under the examples of well-known advisers, and some decisions of Courts of Quarter Session, the figure for assessment would have been wiped out altogether. This indicates that some definite and fixed bases of equality of computation should be established. Surely this is a case for legislation; and the longer the gas industry drifts, I feel convinced the more difficult a reasonable solution will become. A system of equality for gas undertakings generally would be worthy of achievement; and I do not apprehend that the difficulties are unsurmountable.

PARLIAMENTARY ANOMALIES.

We boast of our English law, its adaptability, its completeness and justness; but is it not somewhat cumbrous in the process of making? We fondly cherish and tolerate old fashions, but when additional statutory powers are sought in Parliament by statutory gas companies, how difficult is the passage. The theory of precedent is sacred to the seeking of certain privileges. Let me give just one instance—that of taking land compulsorily by gas undertakings. Compulsory clauses are in numerous Gas Acts; yet it transpired in our last application to Parliament that in no case had such clauses been inserted by the direct decision of the Parliamentary Committees, and thereby the privilege sought by us was shelved, notwithstanding frequent cases having been considered and proved with regard to railway enterprise. It is desirable that our law should be consistent; and when powers are granted in numerous instances in one direction the principle should be acknowledged, and each case settled on its merits apart from a point of precedent. The failure to recognize the intrinsic merit of a case is to take up a position inconsistent with the general aim of legislation. Again, I would draw attention to the provisions of the sliding-scales granted as between electricity and gas. In the Electric Lighting Act obtained by my Company in 1899, a sliding-scale was introduced and granted; the dividends payable being based on the average net price per unit obtained by the Company for energy supplied by them throughout the district, and that without any limitation of discounts. On the other hand, the sliding-scale

provisions in the Company's Gas Act subsequently obtained based the dividends payable upon the gross price of gas chargeable to every consumer, the discounts being limited to a maximum of 25 per cent. This is a striking example of differential treatment between competitive enterprises. The gas industry should be very wide awake to such anomalies, and insist upon collateral rights with other statutory enterprises. Why should statutory gas companies, in the legitimate carrying-on of their business, not have the same privileges customarily given to other statutory undertakings? No corporate body is more closely inspected by Parliament than a gas undertaking. Parliamentary regulation or control is to ensure honesty and justice, one to all; yet the whole course of parliamentary procedure is one long and continued battle. No doubt, difficulties to form an opinion to a fair conclusion are created by witnesses' testimony. Contradictory evidence is always abundant. Eminent witnesses seem clear and evidently right on both sides, yet their differences are such as to make one wonder. Two views quite different to conclusion are certainly not conducive to surety, and often leave decisions—I say with all frankness—in no small measure to chance.

CARE AND ECONOMY IN DEVELOPMENT.

Skilful managers are called upon to prepare and produce great changes in development, the procuring of which is a very knotty complication as between desire and means. The perfect system is ever before one's mind, and great schemes point to full and unstinted development. To carry this out, one must be sure of the means to do so, as scanty outlay and immature plans prove extravagant in the end. The want of means is a despoiler of many great achievements, and yet ultimate triumph is worthy of some sacrifice in the present, or by adoption in prospect, carried out gradually towards perfect fulfilment as finances warrant. Capital should not be spent indiscriminately and with too open a hand. On the contrary, capital expenditure must always be kept well in hand, carefully watched, and dealt with in the same strict manner as the items of revenue. Revenue charges have only a passing and relative effect upon profits which are dealt with and dispersed annually, while capital expenditure is a continual charge by way of interest thereon. We are all prone to give more care and prominence to the revenue items than to those of capital. One bears greatly on the other; and hence a note of danger. Surplus profits stimulate and inspire new schemes, involving increased liabilities by way of interest upon the additional expenditure. Adopting reformed methods of working where estimates indicate a saving all round, is a step in the right direction. The concentration of my Company's manufacturing works to the new site at Howdon—upon which I commented before the Association during construction—has, I am pleased to say, proved to be an unqualified success. Every anticipation has been realized; and the new works stand a monument to the skill of modern gas engineering.

STATISTICS.

Careful attention to working figures is deemed an essential safeguard to everything relative to business or its enterprise. A systematic familiarity with statistics proves their value. They act as a sure and useful guide, and the inferences which they give rise to exercise constructive and far-reaching efforts, promoting watchfulness and investigation necessary not only with regard to one's own industry but to competitive dealings. There is no industrial supremacy nowadays, notwithstanding long-established prosperity. We are brought into touch and competition with eager and powerful adepts in their respective commercial organizations. This is forced upon our notice day by day. Its effect must be seriously realized by due consideration being given to the unit from which comparison begins. This can only be drawn from a thorough study of the respective figures of discovery. Oft-times there is some uncertainty as to the financial prospective results of the year. This may be obviated a great deal by complete periodical statement of accounts (say, quarterly), when attention can be duly given to resulting figures. Each period leaves something to be registered. Again, the year's task is not finished on the publication of the balance-sheet. All difficulties must be analyzed, and their bearing brought to light. Analyzed statistics may prove of great use in various ways. They are of more or less importance as a relative value among themselves, and a treasury of facts with regard to the working of technical, commercial, and financial operations. They are commendable for intimate knowledge and for significance of results, both to the engineer and the secretary, with satisfaction as to their measure to each of the respective departments.

CO-PARTNERSHIP.

Seeing that my Company has been the only one in the North of England so far to adopt co-partnership, some of you are no doubt curious to hear what advantages have accrued from it. To illustrate examples is not my purpose to-day; but I may say it has proved a silent source of strength and the most effective barrier to discontent. Employers are no doubt in all industries suspected of combating and doing as little as possible for their employees. Co-partnership dispels any such suspicion, inasmuch as the results warrant a tone and feeling of doing as much as possible for each other, instead of as little as possible. With us a true sense of discipline is apparent, creating regularity and stability. Fraternal and conciliating relations are well established, marking a strong sense of mutual attachment, a potent mediating force as between capital and labour. The wise principle of co-partnership recognizes the hardworking and honest efforts of employees, respecting and giving due consideration to their feelings of justice. A body of employees, whatever be their grade, conscious of doing right, should have the hearty and unstinted sympathy of employers. All human beings are endowed with susceptibilities and feelings for consideration, the recognition of which brings an active sense of appreciation among all sorts and conditions of employees in carrying out their respective duties, none the worse in the knowiedge that, while the performance of them is scrupulously exacted, they are encouraged and rewarded at all times.

Mr. E. F. Hooper (Sunderland) moved a vote of thanks to the President for his address. He said Mr. Armstrong had touched lightly on an infinite number of subjects, and he thought the members would all have liked to hear a little more about each of the particular phases dealt with. The President had, for instance, opened the door of co-partnership, said this was a splendid thing, and then had shut the door, he might say, almost with a slam. [Laughter.] Had the President been asked questions upon this part of his address, he might have answered in a political way—"Wait and see." [Laughter.] He (Mr. Hooper) hoped the time would come when the President would develop a little more in detail some of the exceedingly interesting points he had brought before the members. He had told them that the gas industry should take the public into its confidence, and speak the truth. Well, he (Mr. Hooper) had never come across a member of the North of England Association who had not fulfilled this condition. If the gas industry was any good at all, it was good enough to speak the truth; and they should never be in a position to make all sorts of unsteady and prevaricating statements to prove doctrines which they believed to be true. If the gas industry could not stand on its own basis at the present time in competition with another industry [laughter], they should say it was time it could. The legal point was an interesting one. There was a tremendous temptation nowadays among expert witnesses—in which capacity some of them, unfortunately, occasionally appeared—to wonder what on earth the result of any particular action might be; and it would be very desirable if they could bring more pressure to bear on their Counsel, and those who had to do with it, that slightly less warped opinions could be brought before the Judges than were often brought at present. However, they had enjoyed a delightful address; and he was sure they would join with him in according a vote of thanks to the President for it.

Mr. T. Hardie (Gateshead), in seconding the proposal, remarked that the members had heard an excellent address. They could scarcely think, sitting there and listening to Mr. Armstrong reading his sentences one after another, that they were not listening to someone reading from Marcus Aurelius or one of the classic authors. The President had put his precepts and words in a way that he (Mr. Hardie) had never heard them put before; and the address was one of the finest he had ever listened to in any association of gas managers.

The vote was accorded with hearty acclamation.

The President, in acknowledging the vote, said he appreciated very greatly indeed the kind words and expressions which had been used. It was no light task to ferret out subjects which might be appreciated by the members of the Association. There were a great many subjects on which they might prepare papers, and, perhaps, in connection with his, there might be thousands of texts for papers by the units of the Association; but he had endeavoured in his address to avoid broaching conventionalities. With some of the points they, no doubt, would not agree; but he felt confident that they were worth considering.

The business then concluded.

Inspection of Works.

The members afterwards inspected the works of the Walker and Wallsend Union Gas Company, and those of the Wallsend Slipway and Engineering Company, Limited. The gas-works were fully described and illustrated in the number of the "Journal" for Oct. 13, 1908 (p. 119).

It may be mentioned that in the entrance hall of the Gas Company's offices, the members were able to inspect a number of specimens of "Vitreosil," in connection both with laboratory appliances and with the handsome portable hand-beaten art metal work gas-radiators manufactured by Messrs. G. Hands and Co.

Complimentary Dinner by the Gas Company.

The company travelled by electric train back to Newcastle, and were entertained at dinner at the County Hotel by the Gas Company. Mr. Charles J. Potter, the Chairman of the Company, presided, and there were about two hundred present.

Mr. Andrew Laing, of the Wallsend Slipway and Engineering Company, proposed the toast of—"The North of England Gas Managers' Association."

The President replied, and said the Association was formed thirty-six years ago. He spoke of the excellent work done by the first President, the late Mr. William Hardie, the Secretary of the Newcastle Gas Company, and Mr. W. J. Warner, of South Shields, the first Secretary. Other early workers for the welfare of the Association were Mr. Joseph Hepworth, the second President, and Mr. William Ford, who, he was pleased to say, were still helping the Association, and were present with them. Only three years ago, Mr. Ford served the Association by accepting the presidency after thirty years; and Mr. Tobey, his (the President's) immediate predecessor, also honoured the Association in a like capacity after an interval of twenty-five years. He thought the honour and dignity of the Association were being well maintained. The President referred to the useful work that was being done by the Association, and particularly mentioned the Special Purposes Section, which, he said, was doing great service for the

individual members of the Association and the gas industry generally. He paid compliments to the Hon. Secretary, to Mr. Waddom, the Secretary of the Newcastle Gas Company, and to Mr. Laing, who had kindly arranged for the members to inspect the works of the Wallsend Slipway Company.

Mr. W. HARDIE (Tynemouth) proposed the toast of "The Chairman and Directors of the Walker and Wallsend Union Gas Company." He said the works of the Company were commenced in 1840, and the chairman at that time was Mr. Addison Potter, the father of their Chairman. He thought all credit was due to those who had had charge of the undertaking. They had adopted a bold policy in erecting the new works on a well-chosen site, of good design, and of an up-to-date character. The works reflected great credit upon the Engineer, Mr. A. B. Walker. The gas industry, in order to be carried on successfully, required not only work and technical knowledge, but in recent years it had been found that it was also necessary that it should be carried on with commercial enterprise and unswerving energy. They all appreciated the sound financial position of the Walker and Wallsend Company.

The CHAIRMAN responded to the toast, and spoke of the pleasure it had given his Company to entertain the members of the Association. They took it as a compliment that their Secretary had been elected President. Mr. Armstrong had been with them twenty-two years; and instead of his interest in the Company's affairs lessening, it seemed to be gaining. Mr. Potter alluded to the financial position of the Company, and said he had recently talked with a rich man who had securities in numerous concerns, and who had made up his accounts for the year. He found that, of all his securities, the only one which had not depreciated was the Walker and Wallsend Gas Company.

The toast of "The Press" was honoured; and the proceedings closed.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

There was a gratifying attendance at the opening of the Ninth Session of the Scottish Junior Gas Association (Western District) last Saturday in the Technical College, George Street, Glasgow.

A feature of the day's proceedings was a visit to the Smoke Abatement Exhibition which is being held under the auspices of the Glasgow Corporation. The members saw there much that interested them; and the kindness of Mr. Alexander Wilson, the Engineer and General Manager of the Corporation Gas Department, on whose invitation they inspected the exhibition, was very much appreciated.

At the opening meeting, which was held in the evening, Mr. R. M'GHEE, of Glasgow, the retiring President, who occupied the chair, welcomed the members, and expressed his appreciation of the kind way in which they had assisted him to perform his duties during the past session. Such had been the support he had received that he had felt these duties light. In introducing Mr. F. L. MacLaren, of Dumbarton, the new President, the Chairman said he was now one of their oldest members. While not actually engaged in the gas profession, he had always taken a deep and active interest in it. He had also carried out a number of experiments bearing a close analogy to the gas profession. The Chairman then bespoke for his successor the kindness and forbearance the members had extended to him, and said he was certain that Mr. MacLaren would worthily uphold the traditions of the chair.

Mr. MACLAREN then took the chair, and at once proceeded to read his

INAUGURAL ADDRESS.

He began by thanking the members for the honour they had conferred upon him in selecting him as their President. He reminded them that the Secretary had prepared an excellent syllabus, and assured them there would be edification, education, and unbounded satisfaction awaiting all those who attended the meetings during the session.

Taking up technical subjects, the President remarked that matter and motion are the great factors of the Universe, and he said he would endeavour to show that gas was matter in motion. He then dealt with the molecular theory, and described the chief characteristics of the ether. This led him to the subject of the speed of light, heat waves, and heat energy. He showed by means of lantern slides that a spectrum is obtained by splitting a ray of light. This proved that rays of different lengths passing from a rare medium to a denser medium were diverted off the straight course. He explained that the important point about this phenomenon is that these waves have no effect on the medium through which they pass—*i.e.*, the glass prism, or what takes the place of the prism in the Universe (the atmosphere). This taught them that in a room there was no virtue in being near the source of heat. The warming effects were principally experienced through the agency of intermediaries. The atmosphere in a room was practically unchanged by the heat waves emitted by the fire; it was heated by what were termed convection currents. Land and sea breezes were, he added, a good illustration of this. Thus the air in a room was heated by contact with the solid furniture, floor, and walls of the room, and was therefore always in motion collectively, causing currents, and sometimes, to their discomfort, draughts—but used by the wise to effect good ventilation. It was here that gas heating had the advantage over electricity.

But how, asked the President, were the walls, furniture, &c., heated? He answered his question by showing that it was in the same way as the earth is heated—by radiation. This was the property possessed by all hot bodies (*e.g.*, flames) of projecting heat from their outer surfaces in such a form that, without heating the intervening medium, it travelled in straight lines until it was intercepted by some solid body. Radiant heat was, strictly speaking, not heat at all, but radiated energy. It was not manifested as heat until it struck some solid body, in which, by setting up molecular motion (for even solid bodies had molecular motion), it manifested itself as heat. Not only red-hot bodies, but bodies of all temperatures, radiated heat in this manner. The President then continued:

To heat a living-room without causing any injurious effects to the health of the occupants, very hot iron or metal surfaces should not be presented for heating purposes—such as is done by using coal-stoves—as iron surfaces above the temperature of steam have a knack of breeding germs abounding in the dust which gathers about such heating apparatus. This phase of the heating problem is of particular interest to gas engineers, as, so far as I can see, none of their methods of heating can have this charge laid against them. Apart from this, even gases are very bad conductors of heat, as instanced by the fact that it is impossible to make an efficient and practical gas-boiler. To store heat in gas, and so transfer it to an engine, Watt, our great engineer, very wisely used water; charged the water with the heat, which, in turn, passed it on to the steam—by evaporation. Hence our steam (but really our gas) engine, using steam because this is the easiest gas to heat, having a very handy medium (water) through which heat can be passed to the gaseous steam. Conduction is therefore of no interest to practical men. Since only solids are heated by radiant heat, it is well to remember a gas (and the one that interests us most is our own atmosphere) only becomes heated by the convection principle, and to a very slight extent by contact with containing walls. If gases are bad conductors, solids are usually good ones; so heat one part of a solid by radiant heat, and it is not very long, usually, before the whole solid acquires the same temperature—thus making itself a willing agent as a transmitter of the more gentle, comfortable, radiant heat waves.

HEATING IN PRACTICE.

Now for the practical side of the problem. The principle of heating air and then passing it into the living-rooms cannot be too strongly condemned, for, by the loss of radiation, a heated body parts with its heat more or less rapidly, according to the temperature of the surrounding bodies; so that if a person is sitting in a room filled with warm air, but near a wall colder than the air, his body will rapidly part with heat by radiation to the wall, and a sensation of chill is the result, although the necessary quantum of heat has been supplied.

VALUE OF RADIANT HEAT.

The leading authorities on science have long since pointed out that wholly radiant heat is considered more healthful and congenial to human life, owing to the peculiar effect it has in passing through the air without raising its temperature; and in this it acts most naturally, for the sun's rays are received in the same way. It will always be found that the most agreeable sense of warmth is that which fully heats (and sometimes overheats) the body, but which leaves a moderately cool air to breathe. The open grate largely fulfils this—particularly as it in itself constitutes an effective source of ventilation.

HOW ROOMS ARE HEATED.

Besides, the radiant heat, which passes through the air without sensible loss, is absorbed by the walls and raises their temperature. The air enters the room by the crevices in the doorway and the windows, at the external temperature, and is heated by contact with the walls, but must obviously be colder than the walls by which it is heated; so that the occupant breathes air refreshingly cool, while the walls, being comparatively highly heated, do not absorb his animal heat with inconvenient rapidity. It will be evident from this that, to obtain a comfortable temperature, the walls themselves must be heated rather than the air; and, as I have said, the only practical way of heating them is by radiation from a fire. There is not therefore the slightest doubt, from a hygienic point of view, that heating by radiation is infinitely preferable to effecting the heating by warming the air. Radiant heat being thus shown to be the best for living-rooms and bedrooms, it is evident that the choice of a heating apparatus for such apartments is limited to two—the open coal-fire, and the gas-fire.

GAS-FIRE v. COAL-FIRE.

All I will say about the coal-fire (which still happens to be a friend to a few of us) is that, for a civilized community who place health and vigour in the forefront of modern necessities to be content with that which sufficed for the earliest and the crudest dwellings, shows that the architect of the modern house and home is guilty of gross neglect in the education of the people for whom he professes to provide the best that science can command for the money laid aside for rent. In the days when one-tenth of one's income was considered an ample sum for spending on rent, makeshifts of heating arrangements were good enough, but scarcely now that the people are asked to spend, not one-tenth, but one-fifth of their income on rent. Surely in return for this the most modern, convenient, and health-and-comfort giving appliances should be supplied.

I nail this contention to the counter, and say that not until the gas profession get to work, hand in hand with every architect in

the nation, will the citizens of our country fully benefit by the energies of the gas engineers of this era to enlarge the scope of gas as a heating agent. An absolutely uniform heat can be maintained with the gas-fire. There is no risk of the fire going out, nor disturbance by mending or stirring it; and the dust of the coal-fire is absent. Again, the gas-fire is of itself a highly useful means of ventilation, the up-draught it creates being uniform and constant; and no soot is formed to obstruct the flue. As a matter of fact, a gas-fire constructed of properly calculated proportions will every hour move at least three times the entire atmospheric contents of an apartment. Is not this important when comparing gas-fires with electric radiators? The average coal-fire burns unpurified gas of its own distilling, and does so under irregular conditions unfavourable either to perfect combustion or to economy. The gas-fire burns distilled and purified gas, and that under perfect conditions of oxygenation and ventilation. In short, gas is "bovrilized coal," as Yeats puts it.

Improvements in Gas-Fires.

There were certain drawbacks which for long hindered the general adoption of gas-fires. One of these was the smell which some stoves gave off. This arose from the combustion being rendered imperfect, either by the flame being allowed to impinge on the ball fuel in such a way as to interfere with perfect combustion or by the supply of air being improperly proportioned to the amount of gas. These causes of smell have been recognized, and a means of removing them devised and introduced into the design of gas-fires. This effectually deals with both causes of imperfect combustion. In the first instance, the proper apportioning of air and gas is secured by a simple adjustment for the air supply and another for the gas, both of which can be worked by the finger and thumb while the fire is alight. The interference with combustion by the impinging of the flame on the ball fuel in an improper way is obviated by making tube (not ball) fuel.

Another objection was the dryness of the air sometimes experienced with gas-stoves, leading in many cases to a vessel filled with water being placed beside the stove to correct this by evaporation. It was long before the fact became generally known that this dryness was no necessary accompaniment of a gas-stove, and that it was entirely due to these stoves being all so constructed that a great part of their heat was given off by convection—overheating the air, and so increasing its capacity to abstract moisture from the human body. So long as a gas-fire was arranged like a grill, of course, the air immediately above was literally roasted. With the vertical front, this drawback is obviated. With the disappearance of the convected form of heat, the drying of the air comes to an end—an improvement of inestimable advantage in rendering gas-fires available in all situations and under all conditions. Not only is this done without loss of heat, but actually by these arrangements a great economy of gas is rendered possible, such as completely meets all objections as to the cost of heating by gas. Thus is secured what is scientifically declared to be the best form of heat for domestic purposes, with a much less gas consumption than was required by the types of gas-fire hitherto in use to give the convected form of heat, with its known disadvantages.

Owing to the improvements in design, and the great aid now rendered to ventilation, the modern gas-fire is a very different apparatus from its earlier and necessarily crude form, so that medical men who once banned gas-fires as a whole are now loud in the praise of these new stoves, and staunch in their use.

As regards economy, taking into consideration the amount of coal which must be burnt before a comfortable and steady warmth is produced, and also the amount which must be burnt after the fire is no longer required, gas must run coal very closely for domestic uses, where it is seldom necessary to have a fire constantly burning for long periods.

Claims of public health and economy so strong and so reasonable cannot be lightly pushed aside. Has the time not come for our local authorities to encourage architects, in the designing of houses of medium rental, to equip them in some apartments, if not all, with gas-grates, instead of coal-fires, which latter they certainly do not exceed in cost, considering the new facilities for their supply? Gas engineers must understand that the prospective purchasers of gas heating apparatus have grown up in an atmosphere of scepticism. Their parents they have heard constantly and at that time truthfully remark, "Gas is dear, a luxury, an extravagance, none who would be called thrifty must be seen using it." That was true. It is not true now; and your duty is to prove that it is not, as you can do if you have a few facts beside you. In spite of opposition, see what a magnificent monument in present-day lighting has been reared to the memory of the past generation. Ours is to open up the still wider and more useful field of heating by gas; for, honestly, electricity is not in it here. The effect of the vigorous propaganda carried on by various gas undertakings' exhibitions, makers of gas heating apparatus, &c., is that the average middle-class householder is coming to recognize the claims of gas heating; and there is much to be said for the view that houses furnished with these newer gas grates, cookers, &c., would command a preference which would steadily grow as their advantages became more evident by continued use.

Testing of Fires.

I should like to make some reference to the testing of fires. The principal points on which information is necessary are the radiation, the flue heat, and the certainty of complete removal of products by the flue. The finding of a suitable method for estimating the radiation presented at one time the greatest difficulties. The problem has now been solved, and several methods are at our disposal. The one perfected at Leeds University is the most generally used. A full description of this is given in the "Transactions" of the Institution of Gas Engineers for 1909 and 1910.* Briefly, the fire of which the radiation is to be determined is placed at the centre of, and facing, an imaginary hemisphere, on the inner surface of which all the radiation from the fire must fall. The value of the radiant energy falling on a particular one of the 81 specific portions into which the hemisphere is divided, and expressed in heat units, is determined by means of a radiometer, or, in other words, a radiation calorimeter, consisting of a number of blackened copper tubes through which water is flowing—the rise in temperature of a known quantity of water giving the heat falling on the radiometer. As the one determination takes about six minutes, while a separate determination to obtain a correction for convected heat requires another three minutes, with at least an interval of fifteen minutes between them to allow the radiometer temperature to become constant, it will be seen that to make 81 such determinations would, on the score of time alone, become impossible in practice. To obviate this, the thermopile is brought into use. This instrument consists of a number of thermo-junctions. When heated, they produce a small electric current, which is then read off on a galvanometer.

After making the two radiometer determinations, the thermopile is substituted for the radiometer in front of the fire. A relationship is thus established between the galvanometer readings and the actual heat units. The thermopile is then moved successively into each of the positions occupied by the 80 portions into which the rest of the hemisphere is divided. Each reading (which only requires a few seconds) is equivalent to a proportional number of heat units. The total of all the readings is converted into heat units by means of the relationship already determined between the galvanometer reading and the actual heat units; the figure thus obtained being the total amount of heat radiated by the fire per hour. During the progress of the thermopile and galvanometer readings, periodic inspection is made of the gas-meter, and a calorific value of the gas is taken. From these figures is calculated the total amount of heat supplied to the fire per hour. From this and the amount radiated, is obtained the percentage radiated. This method suffers the drawback of taking considerable time for each determination; but it gives the total amount of heat radiated, as the complete hemisphere in front of the fire, and by which all radiation must be intercepted, is traversed by the thermopile.

Radiators for Large Buildings—Flueless Stoves.

So far we have been dealing with domestic apartments where the proportion of cubic space is small compared with the superficial area of the walls. In large apartments—such as factories, &c.—we find the cubical content is very much larger compared with the superficial area of its containing walls. To warm the air by way of the walls would take a long time and much more gas. The possible effects of obscure radiation from human bodies to the cold walls are much decreased. In such cases the total heat of combustion of the gas must be utilized to the full. We cannot afford to allow the direct ventilation from the heating apparatus up a separate flue, such as is provided for a gas-fire. The types of gas-heated apparatus used for such work are two—the self-contained gas-heated radiator, and the hot-water radiator system, with a gas-heated central boiler.

The actual appliances in both cases, although known as radiators, supply the greatest part of their heat in the form of convection; the air of the apartment being designedly heated first. Heat supplied in this way is carried rapidly to all parts of the space. The objections which apply to high-temperature convection in living-rooms do not apply here, especially in the case of the self-contained radiator; for not only is the temperature required for the comfort a lower one, on account of the bodily activity of the occupants, but from a properly designed radiator the convection current is at a comparatively low temperature, and the bulk of the air in the room does not acquire a much higher saturation point, while the self-contained radiator at the same time supplies moisture from the gas combustion to compensate for any increased capacity for moisture shown by the warmed air.

The flueless stove, which is now some twenty years old, first took shape as a condensing radiator having an open gas-fire with fire-clay lumps. Some years later came a similar radiator without the open fire; and later still the same stove appeared as a non-condensing hot-air radiator. Eventually, there was produced the gas-steam type which has become so familiar within the last half-dozen years or so, and has since been followed by several varieties of hot-air radiator. Following on the advent of the gas-steam radiator, there has rapidly arisen a great increase in the application of gas-heating by flueless stoves of this class to a wide variety of domestic and industrial uses. Among the reasons for this were, no doubt, the fact that a reliable automatic control of the gas consumption in a quick-heating radiator was rendered possible, for the first time, by the medium of steam being introduced, with a consequent degree of economy in fuel and a resultant minimizing of the combustion products much beyond anything that had till then been attained. A further reason which has doubtless made for the popularity of the gas-steam type was that, the products of combustion being kept out of the interior of the apparatus, there

* See "Journal," Vol. CVI., p. 821; and Vol. CX., p. 810.

was no internal deposit to remove; and this, coupled with the absence of corrosion, meant an indefinitely prolonged life for the stove. Owing partly to the automatic control and partly to constructional arrangements to that end, the flame is effectually kept from contact with any part of the apparatus, and the invaluable feature of perfect combustion is ensured under all conditions.

It has been necessary to briefly recall these details, to lead up to the very important question of flueless stoves in relation to the purity of the atmosphere. Section 6 of the Factory and Workshop Act states that the means employed to heat a workshop must be such as shall not interfere with the purity of the atmosphere; and from time to time doubts have arisen in official quarters as to the position of flueless gas-radiators in relation to this clause. As a matter of literal interpretation, no doubt, it might be argued that no flueless stoves of any kind could be brought within the four corners of such a clause. But, obviously, a matter of so great importance and wide application must be viewed in a broad way, and providing that the combustion itself is perfect (*i.e.*, that no carbonic oxide is produced), the matter would seem to resolve itself into practically a question of the number of parts of carbonic acid per 10,000 parts of the atmosphere of the apartment.

It has been proved that at any rate up to 225 parts per 10,000 carbonic acid has no effect on the human organization, and that probably it is not the presence of carbonic acid but the absence of oxygen which causes ill-effects when the percentage is above this. So much for carbonic acid. But if this is the case, what is the objection to carbonic acid? It rests on the fact that the carbonic acid is measured so as to show the presence of air which, having been respired, contains objectionable organic impurities, which it is so far impossible to estimate directly, and the amount of which the carbonic acid is the harmless indicator.

A few years ago, a Departmental Committee was appointed to consider ventilation in workshops and factories. In their report, they recommended a maximum limit of 12 parts of carbonic acid per 10,000 parts of air as a daylight standard of purity. This allowed, after deducting the 4 parts of carbonic acid normally present in the atmosphere, for an increase of 8 parts of carbonic acid per 10,000 from animal sources. Recognizing the fact that carbonic acid itself is non-injurious, they recommended a maximum of 20 parts of carbonic acid at night when gas or oil illumination was used. In view of the fact that even 200 parts of carbonic acid per 10,000 is of itself non-injurious, there appears to be no reason why this proposed limit should not be considerably raised, so long as it is certain that the carbonic acid is produced from the combustion of gas, and not from respired air. Nor does it seem unreasonable to ask that where gas is used for heating during the daylight hours the maximum limit should be placed at the same figure as when gas is used for illumination during the dark hours, with, of course, the same proviso as to the origin of the carbonic acid. This would enable the use of gas for heating to be extended to places where it is already in use for some industrial process, and where, owing to the carbonic acid already present, such use would bring the amount above the present daylight limit. In ordinary cases, frequent tests have shown that, in a properly ventilated room, a self-contained radiator sufficient to heat the room will only add to that already present a matter of 5 parts of carbonic acid per 10,000 at breathing level; and in some instances, owing to its stimulating of ventilation, it actually reduces the previous amount.

In the course of experimenting, an interesting sidelight has presented itself. In certain cases, the proportion of carbonic acid in these instances has proved to be actually less at the close of the day's full use of the radiators than on the previous day without them. This is due to the sluggishness of the normal ventilation being stimulated by the heat of the radiator.

It must not be forgotten that it is the gas-flame which has the valuable hygienic advantage, not only of killing a number of the micro-organisms that may be present in the air, but, by virtue of the naked flame, of burning up and destroying a considerable quantity of the organic matter exhaled by the human occupants of the room. Reference may be made here to the fact that it has been suggested that, with the gas-steam radiator, a room can be heated with less gas than is needed to light it. Economy indeed! Of course, this statement must be qualified, depending on how you light and how you heat.

There is one constituent of the products of combustion which I have yet to mention, and that is the sulphur dioxide. As gas engineers, you are familiar with the general endeavours to get reduced the sulphur restrictions imposed by Parliament. In cases where this attempt has been successful, it has generally been followed by a very considerable rise in the amount of sulphur contained in the gas. It is, of course, argued that the increase is from organic sulphur compounds, and not from sulphuretted hydrogen. That this is the case is no doubt correct; but from the gas heating engineer's point of view the origin is immaterial. What he has to contend with is the sulphur dioxide which results from combustion. Sulphur dioxide in quantity is a notable drawback to the use of gas for lighting; but more especially is it so in the case of gas-heating, since this entails the continuous use of gas in the apartment, whereas lighting is only necessary during the hours of darkness. This question then becomes a serious one for gas engineers; for the extended use of gas for heating has accounted for a considerable increase in day consumption during the last few years; and should the Home Office introduce regulations restricting the permissible quantity of sulphur dioxide in the air in a room, some gas undertakings at least would find themselves deprived of a very useful outlet for their product.

In anticipation of the criticism that apparatus with flues can be used, thus removing the sulphur dioxide, I would say that in the class of heating to which I refer gas is seriously handicapped if it is forced to lose any percentage of its heating value directly up a flue.

The address, which was illustrated by a series of limelight views and interesting experiments, was listened to by the members with great attention.

Mr. M'GHEE remarked that the address might be described as a treatise on the elementary scientific facts about radiation and convection. It was a good thing the President had brought before the members, for many a time, when carrying out simple experiments, one became puzzled by some unforeseen result. Some of their earliest and fundamental ideas had been overlooked until they stumbled across them later on. He congratulated the President on the very thorough manner in which he had gone into his subject. The information that had been put before them relative to the methods of testing gas-fires, &c., was extremely interesting to all, especially the allusion to the roasting of air from the horizontal fire as contrasted with vertical fuel. He had placed his facts in such a simple and lucid manner before them that he (Mr. M'Ghee) could not see anything to criticize.

Mr. A. H. WHITELAW (Glasgow), who characterized the address as a valuable contribution to the Association, expressed surprise that the gas-fire had taken so long a time to come to its present state; but he attributed this to the want of knowledge on the part of manufacturers in regard to the elements of the gas-fire. He considered manufacturers were not altogether posted up in the simple fundamental principles of scientific heating; and he thought that if one mistake had been made that evening it was in not issuing invitations to the Seniors and to manufacturers to be present, in order that they might have seen the President's experiments and reflected upon the simple facts. If they had known the elements of heat ten or twenty years ago, the public might have been enjoying the gas-fire over a very much longer period than they had done.

Mr. SHEPHERD (Glasgow) said one thought that had occurred to him was that architects and builders might look into the matter, for he considered much might be done if they could be induced to put in gas-fires when building houses.

A MEMBER remarked that he believed they had made a start in London.

Mr. SHEPHERD (continuing) said it was time a start was made in Glasgow and in the Provinces. They might, for instance, have gas-fires placed in sitting and bed rooms. By getting these apartments so furnished before people entered them, he was confident much would be done to popularize the gas-fire.

The HON. SECRETARY (Mr. D. Fulton, of Helensburgh) expressed the opinion that Mr. Whitelaw had been rather severe on the manufacturers. Scientific research had been undertaken by them; and the public were indebted to them for most of the improvements which had been made. The traders were out for business. Commercialism was their first concern; they had to supply the public demands. It was of no importance to them whether or not they were doing a wrong thing. People came to them with preconceived ideas, and a million years would not alter them. Certainly, it would be a very good thing if proper arrangements could be made, when houses were being built, for fittings to be put in for gas fires and cookers. It was a great defect in present-day conditions that when gas-fires were wanted in a house that had been put up thirty years ago they found a half-inch supply pipe, which was expected to feed sometimes as many as three gas-fires. [Laughter.]

Mr. JOHN WILSON (Falkirk) said he was sure, from the address to which the members had just listened, that Mr. MacLaren would worthily adorn his office. He thought the members might all be gas-radiators, and radiate as much as possible, so that the people round about them would learn more of the advantages of gas, and not have to go to the Smoke Abatement Exhibition to do this.

The PRESIDENT, in returning thanks, said he had purposely kept to the elementary side of the subject, because he felt that what was wanted was to get the loose ends together and put them forward again so that they might be imprinted on their minds. From his own experience, if they met with a difficulty that seemed merely an elementary thing in their past education, some theory would crop up, and they would say "That's it." Even though they were quite familiar with his experiments, the mere brushing up of one's mind did one good.

The business then closed.

We have received a copy of the report on the results of the investigation of the Munich chambers at the Hanau Gas-Works, near Frankfort, carried out by the Instructional and Experimental Gas-Works Committee of the German Association of Gas and Water Engineers between the 4th and 11th of December last. The trials were conducted under the direction of Dr. H. Bunte; and in his final remarks on the report he states that the installation "proved itself to be in every respect a quite up-to-date system of carbonization." The quality of the gas was uniform, its calorific value extremely good, and the coke considerably better than that produced from antiquated oven installations.

NEW STOKING PLANT AT PERTH.

The formal inauguration of the new electric mechanical stoking arrangements at the Perth Gas-Works took place last week, in the presence of members of the Town Council, representative citizens, and contractors. The journey to the Friarton was made in one of the Corporation omnibuses; and on arrival the party made a minute inspection of the plant in operation, and also had an opportunity of comparing the new system of charging and discharging the retorts with that formerly in use—namely, the West manual stoking machinery, which is retained as a stand-by. The company were convinced of the great improvement on the old system of carbonization, and also of the better conditions under which the work was carried out.

The cost of the whole scheme is £4364; and it is felt that the economies in coal and in other directions, together with the improved returns from residual products, will result in Perth keeping its position of producing gas at a cost which compares very favourably with that of towns many times larger. In this connection, it should be noted that the fixed capital charges on the undertaking greatly handicap the Perth Gas Department in the direction of cheaper gas. But while the burden of capital on the concern is being gradually reduced, the consumers themselves can still further assist in its reduction by using gas to an even greater extent than they are doing at present. The Gas Department have encouraged the use of gas by hiring out cookers and gas-fires and other useful apparatus; and these are now given out free of charge. Gas is nowadays being adapted to an increasing variety of purposes; and greater developments are looked forward to, industrial and otherwise. Increasing interest is being daily displayed in the use of gas for heating purposes, in lieu of coal, and so mitigating the smoke nuisance.

Description of the New Plant.

The coal is delivered on the line of rails running through the coal-store, at a height of about 15 feet above the ground floor level, and the waggons are tipped by means of an hydraulic ram into a large wooden receiver, from which the flow is regulated by a jigger feeding tray. This tray feeds the coal forward to the coal-breaker. The fine coal passes through a grating in the tray direct to the boot of a bucket elevator; and the large coal, after being broken, passes into the same boot. The jigger feeding tray, the coal-breaker, and the bucket elevator are all operated by a steam-engine placed on the ground level. The coal is raised by the elevator to the roof of the retort-house, and discharged on to two tip-tray conveyors, running in opposite directions.

These conveyors are operated by an electric motor, and are made to discharge the coal into any portion of the set of overhead coal-bunkers. The bunkers extend half the length of the retort-house, and are capable of containing 24 hours' maximum requirements of coal. The bunkers can also be filled by means of hutches elevated by an hydraulic hoist and travelling along a narrow-gauge railway situated in the rafters of the retort-house roof. The bunkers are provided with sliding doors on the bottom, placed centrally with each line of retorts; and these doors are opened and closed by means of a lever attached to the stoking machine. On the top of the stoking machine is a hopper, which automatically weighs each charge of coal.

The stoking machine, which is a combined charger and discharger of the De Brouwer design, obtains its power by means of an overhead electric trolley system, and is made to travel from end to end of the bench, and to be raised or lowered at will to suit the different tiers of retorts. A second motor attached to the machine operates a telescopic pushing ram, which is made to enter the retort at one end and push the coke right through, discharging at the opposite end. A third motor sets in motion an endless rubber belt, revolving round a hollow-rimmed wheel, on to which wheel the coal to be charged is made to drop.

The process of charging consists in rapidly revolving this wheel and belt; and when coal is dropped into the space between the belt and the wheel, it is carried forward towards the retort at a high speed and projected in a continuous stream into the retort, where it forms an even layer throughout the full length of the retort, which is 21 feet long; the speed of the motor being slackened as the retort begins to fill up towards the mouth. No part of the projector enters the retort; and so it is not subjected to extreme heat or to excessive wear and tear. Consequently the retort can be completely filled up with coal if desired.

The coke is discharged by the pusher, and drops into quenching chambers below the stage floor, and from there falls into tipping hutches. The hutches are drawn out on a narrow-gauge railway to an electric coke-hoist, and elevated to a set of jigging-screens (operated by a steam-engine), on to which the coke is tipped and separated into different grades of size for the market. The waggons necessary for handling the coke traffic are moved as required by an electric capstan.

The electric power is obtained by means of a special cable laid direct from the Corporation electricity station, and has a capacity of 42 K.W. There is also an alternative supply generated on the works by means of a 42 H.P. gas-engine direct coupled to a 23 K.W. dynamo through a flexible coupling. The gas-engine is fitted with a compressed air starting arrangement. The whole of the electric plant is controlled by a switchboard in the generating room.

Messrs. Babcock and Wilcox were the Contractors for the jigger coal-feeding tray, extension of the elevator, and the overhead tip-tray conveyors; Messrs. Henry Balfour and Co. for the overhead coal storage bunkers and the coke-quenching chambers; and Messrs. W. J. Jenkins and Co., for the De Brouwer combined charging and discharging machine.

The contracts for the various sections of the new plant were made under the management of the late Engineer, Mr. W. B. M'Lusky (now of Halifax); and the carrying out of the scheme has devolved upon the new Engineer, Mr. David Vass.

The Tea.

Subsequent to the inspection, the company adjourned to the Engineer's Office, where tea and other refreshments were served. Lord Provost Macnab presided; and the Loyal and Patriotic Toasts were given from the chair.

The Lord Provost, in proposing success to the new undertaking, said they all recognized that this was an interesting occasion. It was fitting that they should wish success to the new plant, and continued prosperity to the Gas Department as a whole Luckily for the city, the Gas Department had been admirably managed, and had had the good fortune to have good Conveners. It was only a few years since Mr. M'Lusky suggested the advisability of getting mechanical stoking plant. At that time Ex-Bailie Hamilton was Convener of the Gas Committee, and quickly did he become an advocate of Mr. M'Lusky's proposal. He visited Derby to see the mechanical stoking there, and came back more than ever convinced of the advantages of the system suggested by Mr. M'Lusky.

As most of them knew, Bailie Hamilton's successor in the convenership was their friend Ex-Bailie Macpherson, who was an active supporter of the scheme. It fell, however, to the lot of Treasurer Clark to pilot the scheme through the Council; and this he did successfully a year ago. Now they were met for the purpose of inaugurating the new mechanical stoking plant, which he believed would give their city better and cheaper gas.

Simultaneous with getting a new plant, they had a new Manager; and he was sure they all recognized that in Mr. Vass they had a very worthy and fitting successor to an able predecessor; and he ventured to think the Gas Department had entered upon an era of renewed and increased prosperity. He asked them to drink to the success of the new plant, coupled with the name of the Convener, Treasurer Clark.

Treasurer Clark, in replying, said he was sure they were all satisfied with what they had seen. There were certainly some differences in the Council as to whether this would be the most opportune time to incur additional expense; but now he thought every member was satisfied that what they had done was a step in the development of a great undertaking, which would ultimately be financially successful to the Corporation. The better quality of the coke was evident; and he did not think there was any question regarding the more humane conditions of labour. That was a question of first importance. He thought the gas consumers of Perth, with the additional facilities which they now possessed, would look in the future to seeing gas produced at an even lower rate. He looked forward to the day when they would be able to produce it at 2s. 6d. per 1000 cubic feet. He took little credit for the introduction of the new machinery. A great deal of the spade work in the matter was done by Ex-Bailie Macpherson. He had also had great assistance in this matter, not only from Mr. M'Lusky, but also from his successor. Mr. M'Lusky, who fathered the scheme, left after its inception; but he was glad to say that Mr. Vass, since he came among them, had been a thorough believer in the scheme, and had worked enthusiastically for it. The Council made a proviso that if necessary Mr. M'Lusky should be brought back to advise them on any part of the scheme; but he was glad to say that the Gas Committee had not found it necessary to make use of this proviso. Mr. Vass had been able to step in and carry the matter through without any consultation with Mr. M'Lusky; and they should give him full credit for the successful culmination of the scheme.

Bailie Scott, in submitting the toast of "The Contractors," said in an undertaking like this, amounting to between £4000 and £5000, it was of the greatest importance that the Corporation should get in touch with contractors who were able to fulfil the duties they undertook. There were five of them involved in this work; and he was glad to be able to tell them that every one of them had done what a contractor was expected to do. They had finished their work in a businesslike fashion, there had been no friction while the work was proceeding, and everything had turned out satisfactorily up to date, with the exception that they thought it might have been installed a little earlier. The coal strike, however, intervened; but he was sure they would all be pleased to learn that they had got from their Contractors an excellent job—every part performing its work perfectly, and leaving Mr. Vass in possession of a machine which he would work to advantage in the interests of the City of Perth.

Mr. J. E. Lister (Messrs. W. J. Jenkins and Co., Limited), in replying on behalf of his own firm and the other Contractors, said they always tried to give a good job when they were asked to supply any plant; and it was very gratifying to them to know that their efforts were appreciated. They must thank Mr. Vass for the assistance he had given them since he came on the scene, and they trusted the Corporation would reap the full benefits from the machinery. The Contractors could say that the Corporation had now got an up-to-date plant, capable of giving first-class results, both on the score of economy, and also, as they made claim, on the score of humanity. The work of a stoker in the gas-works was a very arduous one, and his labours were very greatly decreased by the use of that automatic machinery—in fact, the man was now more of a mechanic. On behalf of the Contractors, he asked Convener Clark to accept a beautiful rose-bowl and silver salver, suitably inscribed, as a small memento of the successful completion of that extension.

Treasurer Clark said these gifts came to him as a great surprise. He did not expect that any special reward would be given to him in the shape of that handsome presentation. He felt that he had done little to deserve it, and that the compliment was not paid to him

personally, but as the official head of the department as representing the Town Council generally. He accepted the gifts, with cordial thanks, and promised to retain them in his family as a memento of an interesting occasion in his public life.

Giving the toast of "The Gas Manager," Bailie CALDERWOOD said he was sure they were delighted with their choice. Mr. Vass had proved himself a gentleman of many parts, and he had carried through the business as though he had been with them for twenty years. Everything had gone on smoothly. He was sure Mr. Vass would find Perth and the Town Council pleasant to get on with, and that the Council would never regret having Mr. Vass as their Manager.

In responding, Mr. VASS said he appreciated the expression of goodwill and confidence. He believed he would find a home in Perth.

The health of "The Lord Provost," proposed by Dean of Guild HENDERSON, was drunk with musical honours; and was suitably responded to.

CONSTRUCTION OF LARGE GAS-ENGINES.

At the Meeting of the Iron and Steel Institute in Leeds last week, a paper on "A New Type and Method of Construction of Large Gas-Engines" was read by Mr. ALAN E. L. CHORLTON, of Manchester. The following are extracts from it, and a report of some of the remarks to which it gave rise.

The theoretical economical advantages of large gas-engines as prime movers are so well known in this country, particularly when using the waste gases from either blast-furnaces or coke-ovens, that some explanation must be sought for the relatively slow progress which has taken place in their use when compared with that on the Continent, especially in Germany. The situation may have been brought about by one or other of two quite different causes, or a combination of the two: (1) The usually credited disadvantageous characteristics of the gas-engine itself; or (2) the reduced first cost and peculiar applicability to existing installations of its most formidable competitor, usually the steam-turbine of the mixed pressure type.

What are the characteristics of the large gas-engine which have restricted its progress? It is to be feared that they are still, to the general industrial mind in this country, as follows: (1) Not fully reliable. (2) High in first cost and installation. (3) High in cost of upkeep. (4) Developed and brought into greatest use abroad. While the steam-turbine was invented and developed in this country; is cheaper to instal when steam-boilers, &c., are already in use or exhaust steam is available; is considered more reliable; is reputed to have a lower cost for repairs and upkeep; and when of the exhaust type, enables much old plant to be retained in use, while still effecting considerable economy. It is not the object of the paper, however, to enter further into this comparison, but merely to consider it as affecting the question of the large gas-engine from the point of view of design, cost, &c.

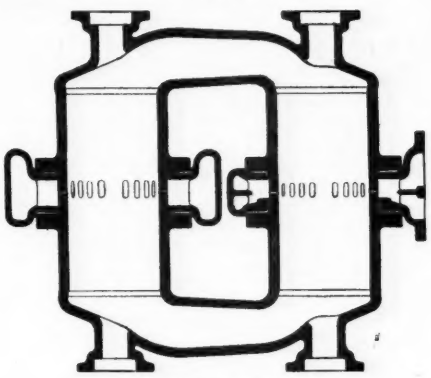
The limitations which have prevented the progress of the large gas-engine will be seen to be primarily due to the prevalence of the belief of unreliability, and to the comparatively high total first cost of installation.

UNRELIABILITY.

This view of unreliability has, of course, been formed from the troubles experienced in the past, though it has been actively combated by various engineers when referring to present types. It may be said constructionally to refer to the cracks and breakages of important parts of the engine (undoubtedly a too common occurrence in the past). Generally these troubles sprang from initial foundry strains set up between the inner and outer walls of the casting when these were cast in one piece, as was the original practice. These initial strains, augmented by those set up through the different temperatures of the parts when working, eventually caused cracks and failures. This more than ordinary occurrence of cracks compelled makers first to discover the reason, and then to amend their designs to prevent them; and the final forms of all types had the inner and outer skins of metal connected only as far as possible in one place—the other ends being left free to allow all the differential expansion and contraction set up in the foundry and in working to take place freely. A flexible connecting membrane completed the jacket to retain the cooling water in place.

The next source of unreliability is in the valves and valve-gears, subject to the heat and stress of the explosion. As is shown by the well-known annual report of Mr. M. Longridge (of the British Engine, Boiler, and Electrical Insurance Company), this is a frequent cause of failures for all prime movers. Obviously, therefore, an improved engine should, if possible, be valveless, have cylinders of simple pipe form, and have separate jackets. The only large engine made with cylinders of pipe form without valve pockets, &c., and where the two pistons performed the various valve functions successfully, was the Oechelhaeuser. The disadvantages of this type, which have restricted its use, though its thermal economy is well known, spring from other causes, as high first cost, large floor area covered (horizontal type), &c.

The success of a valveless action was confirmed by the author's English experience with the working of the central exhaust ports by the piston in the Körting type engine—an experience which clearly indicated that there was no apparent reason why the air and gas inlet to the cylinder should not be controlled by a similar method in an adjacent cylinder. The outcome of this was the adoption of two parallel cylinders with ports about the middle, connected by specially shaped passages at their ends; one piston thus controlling the inlet through the ports in one cylinder, and its fellow expelling the exhaust through a similar set of ports in the other cylinder. This design was more or less bound to be of the two-cycle type; and he naturally leaned to such a principle, seeing that his experience had convinced him that by retaining, among other things, small cylinder diameters, it was really the most suitable form for large powers. A somewhat similar type of cylinder had already been known in the single-acting form for small motor engines for a number of years; but it had not been adapted to large powers nor made double-acting in the special form in which the author presents it.



Section of the "Duplex" Engine.

The cylinder consists of two single-walled U tubes placed end to end; the inlet and exhaust ports being about the joint. Flanges on the cylinders—set back somewhat from this juncture—hold in between them the exhaust and inlet boxes. The whole cylinder unit presents extremely simple forms of single-walled castings, particularly suitable for successful and economical foundry work without setting up casting or expansion strains, and also for use in internal combustion work itself, as there are no pockets or irregular shapes; all sections are more or less cylindrical, including the connecting passages. No heavy flanges or joints occur about the points of maximum pressures and temperatures, as in the ordinary type of engine. This form gives most effective cooling to all parts, as, being inherently of a strong section, they can be made with comparatively thin walls. The efficiency of the cooling is further increased by the accessibility of the water to all parts of the combustion chamber, the usual thick flanges and joints there being avoided. Thus, the engine may run at a higher temperature than is usual in the present large sizes.

All the cylinder, &c., walls being single, the jacket must be provided in a suitable manner to retain the necessary water, and this is most readily done by dropping the whole duplex cylinder into a simple tank; the cylinders resting by their central flanges on stools on the tank bottom or engine entablature. By this construction is secured at once complete allowance for temperature expansion without restraint.

No doubt the present large horizontal gas-engines, with their simplified valve-gear, are a great improvement over the previous types. Still the further great advantage of an engine with no valve-gear must be apparent, particularly when taken into account with the possibilities of higher rotational speed. There still remains the disadvantage of heavy capital outlay when the present large engine of the horizontal type is considered.

HIGH FIRST COST.

It having been shown how in the "Duplex" design the unreliable parts of the gas-engine are effectively dealt with, it remains to meet the other objection to the horizontal type of gas-engines of large power—*i.e.*, the high first cost of installation. The cost of the installation of a gas central station primarily consists of: (1) Engines. (2) Fly-wheels. (3) Electric generator. (4) Foundations. (5) Buildings. (6) Crane. (7) Switchboard and cables. (8) Auxiliaries, &c. The first six items are, probably, possible variables, and so will be considered in order.

For large powers, the present comparatively slow-speed horizontal engine is the only one in the field; and the large amount of room taken up by this type, with its expensive foundations, &c., is well known. The cheaper prospect, judging from steam usage, and some work already done in medium-powered gas-engines, is in the vertical design. It seems necessary, therefore, that the engine should be vertical high-speed enclosed with forced lubrication, for by it fly-wheels are greatly reduced in size, weight, and price; generators are less by about 50 per cent.; foundations, being a simple block, are cheaper by a like ratio; buildings, owing to the small floor space taken up, are greatly decreased in size; and the crane is of less span, and probably has to lift a much less maximum weight.

As the vertical "Duplex" type runs at twice the speed of the present horizontal, and if the cost of the engine itself is not taken at a lower rate, although it seems reasonable to suppose that it might be, we get the following total costs per brake-horse-power: Horizontal, £8·85; "Duplex," £7·05. These figures are comparative only, and might be taken on a lower basis. The reduction

in cost, however, effected by installing the large vertical "Duplex" type of engine as against the present horizontal engine is 20 per cent. If the engine is taken at £4·5 per brake-horse-power, the gain is 26 per cent.

The "Duplex" Engine.

A brief general description of the improved type of gas-engine derived from the foregoing would be: The engine is of the vertical type, very similar in a general way to those steam-engines now so much in favour in this country. It works on the two-stroke cycle. All working parts are enclosed, and the lubrication is by oil under pressure from a direct coupled rotary pump. The engine may thus run at considerably increased rotational speed, and from the fact that there is a compression on each stroke of the two-cycle engine balancing the inertia of the reciprocating parts, a higher piston speed than is usual can thus be adopted with the attendant thermodynamic gain. The cylinders are of the "Duplex" valveless type, supported about their centres, and free to follow the various temperature expansions in every direction. The necessary water-cooling jacket is provided by the cylinder being placed within an ordinary cast-iron tank, and where the exhaust branch passes through the tank side a flexible connection is provided. Ordinary air and gas charging pumps, driven by an auxiliary eccentric, are provided at one end, within or alongside the tank, and connect direct to the inlet-valve box of one cylinder. The "Duplex" power cylinder is so arranged that the exhaust piston has a lead over the inlet piston. The governor is gear-driven, and acts on a simple control valve on the pumps. The ignition is of the rotary magnetic high-tension type in duplicate. The other details of the engine construction are similar to standard high-speed steam-engine practice.

In order to indicate the large powers for which these engines can be built, the cylinder dimensions of a vertical twin "Duplex" engine of 6000 B.H.P. may be noted. These cylinders are only 36 inches diameter with 43-inch stroke, and the speed of revolution is 140 per minute. The fly-wheel is 12 ft. 3 in. diameter and 60 tons in weight; and the floor space taken up by the engine is 475 square feet. It must be obvious that these sizes are by no means the limit; and the author sees no reason, from his experience, and from what has already been done in other engines, why cylinders of 48 inches diameter should not be successfully used. It is interesting to note here that a triple "Duplex" engine with 48-inch cylinders and 4-feet stroke, running at 125 revolutions per minute, would furnish about 16,000 B.H.P. at quite a moderate mean pressure. The total number of moving parts under explosion stress for engines of equal turning moment is: Twin tandem four-cycle horizontal, 20; vertical "Duplex," 4.

The author proceeded to consider how the conclusions so far drawn agreed with, or at any rate were not incompatible with, the thermodynamic *desiderata*, &c., as observed by others. Having quoted the opinion of M. Mathot, the well-known authority, on the principles that engine builders should follow in further improvements in their designs, he claimed that in the design evolved from his somewhat considerable practical experience in the use of the large gas-engine in England, there was general agreement with these suggestions. M. Mathot had called for a system of governing with a constant ratio of mixture, &c. This is exactly the method employed in two-cycle engines with separate gas and air charging pumps of correct proportionate volume—the mixture, when it is delivered, being always of this proportion; and the "Duplex" engine is of this type. Increased compression and economy are made possible by the pocketless form of the cylinders, thorough scavenging, and effective cooling. Scavenging is, as usual in two-cycle engines, done by an air-pump at about 4 lbs. pressure. Free expansion of all parts is completely provided for; control of the cooling water temperature may be readily effected by the governor; and there is recovery of waste heat from the exhaust.

A standard high-speed engine of the vertical "Duplex" type, upon which very exhaustive tests have been made on the shop test-plate, gave the following figures:—

Mechanical efficiency	85 per cent.
Heat consumption per B.H.P. . .	10,500 B.Th.U.
Water consumption per B.H.P. . .	4 gallons.
Oil consumption per B.H.P. . . .	0·0004 gallon.
Governing	1½ per cent. rise full load on and off—steady afterwards.

These results are from cylinders 15½ inches diameter and 18-inch stroke, and will doubtless be improved upon with larger cylinders and further refinements.

In conclusion, the author said that so far the experience with the new type of gas-engine described in the paper had not been very extensive; but, with a full knowledge of what gas-engines with their troubles were in the past, he was happy to say it had been uniformly successful. The first engine built was running on load in parallel with other gas sets within two hours of its first starting-up on gas—a result with a new type gas-engine which he was inclined to think was without precedent.

Discussion.

M. Adolphe Greiner, who was asked to open the discussion, suggested it would be better if a short communication prepared by his son, who had specialized in gas-engines, could be read.

In the course of his communication, M. Greiner, jun., stated that he had always been surprised at the slow progress made in Great Britain in the matter of the rational utilization of gas, more particularly that produced in blast-furnaces and coke-ovens. Mr. Chorlton had in his paper given an explanation of the want of confidence in large gas-engines displayed by most British manufacturers. This he (the writer) must be allowed to say was quite unjustified. It could hardly be maintained that the numerous engineers who, having had to choose between turbines and gas-engines, had decided in favour of the latter, had all been mistaken. Among the many difficulties to be overcome, Mr. Chorlton had, with reason, pointed out as one of the greatest that of making cylinders to withstand the expansion strains met with in large gas-engines with cylinder diameters up to 51 inches. It was true that a large number of cylinders had been rendered useless by cracking or splitting; but such occurrences as these might now be considered as ancient history. Mr. Chorlton was mistaken in supposing that the majority of gas-engine builders had taken to the style of cylinder composed of several parts which he had described. On the contrary, in most cases they had simply sought out the cause of the evil and removed it. The author nevertheless deserved praise for having tried to produce a valveless engine with cylinders of very simple form, and with separate water-jackets. The engine described in the paper was vertical, and on the two-stroke cycle. He (M. Greiner) had always been of opinion that the four-stroke cycle was the proper one for gas-engines, as the two-stroke engine must be accompanied by air and gas compressors. Mr. Chorlton's very able design was, no doubt, worthy of admiration; and it was to be hoped that future years of practice would confirm the results of his first essays. At the same time, he (M. Greiner) did not believe the engine presented any real superiority over the large gas-engines at present constructed on the Continent.

Mr. A. Lamberton remarked that the paper was very largely the explanation of a fresh design got out for the purpose of overcoming difficulties which had been experienced in gas-engines of previous design; and, broadly speaking, he thought the author was on the right lines for removing these difficulties. The only critical remark he had to make upon the design proposed by Mr. Chorlton was that the two cylinders were parted in the middle through the ports, and the upper and under U castings were not in one piece. He should have thought that in engines of any great size the distance from the centre of the cylinders must be considerable; and the length of this connecting leg or pipe, top and bottom, must be a source of much expansion under the high temperature. Yet there was no provision by which the centres of the engines could be allowed to spread. In order to meet this expansion of the connecting-pipes, he would much like to ask Mr. Chorlton if he did not consider that he had raised a point of some importance, particularly as the engines became larger.

Mr. Walter Dixon said he wished to congratulate the author, because he had had the opportunity of seeing the one engine which had been built according to the design described in the paper, and also two engines which had been altered. The importance of the paper seemed to him to lie in the direction which Mr. Lamberton had pointed out; it was another stepping-stone to simplicity. This was the really important point. The question they seemed to labour at these meetings was that we in Great Britain were not so satisfied as to the reliability of gas-engines as they were on the Continent. In his opinion, however, the time for this line of argument was gone. People in this country were satisfied as to reliability; but what they were not satisfied about was the thing that had kept them from adopting gas-engines largely, and this was an economic question. They all knew that it was possible to get perhaps twice as much power from gas in an engine as under a boiler; but if, by putting gas there, they could get as much power from the boilers as they wanted, or as they could readily economically use, this was a thing which would keep the gas-engine down. If they took the capital cost into consideration, they would find that, as an economic question, the time had not yet come to give up steam generation for generation by engines using blast-furnace gases. Nevertheless, he wished to emphasize the point that we in Great Britain were satisfied with the gas-engine. He would like to bury the idea that we felt that gas-engines were not reliable, for they were; and they would become more popular in direct ratio to their becoming simpler.

Mr. Stokes remarked that reference was made in the paper to the trouble and annoyance caused by the use of an exhaust-valve. This was generally admitted. But even though the design had been improved, there was an attendant trouble, which developed sooner or later. He noticed further that, while in his previous design Mr. Chorlton dispensed with the exhaust-valve but kept the admission-valve, he had now gone a step farther, and had dispensed also with the inlet-valve, which he (Mr. Stokes) thought was an elegant tribute to the advantage of one of the striking features in the Oechelhaeuser engine. He thought that Mr. Chorlton would agree with him when he stated that he had simply taken the Oechelhaeuser engine and practically bent it in two. The author had also laid it down that the cylinder should be of pipe form, as simple and plain as possible; but he made bold to say that in the Oechelhaeuser engine this feature was found in the largest degree. It simply consisted of a straight tube in independent water-jackets; and there were a few small holes for inlet, expansion, ignition, &c. All the points dealt with in the paper had been fully considered by his firm (Messrs. Beardmore and Co.); but in some cases they did not feel justified in following them up. The author spoke of the mixture being kept always strictly proportionate and accurate in his engine; but he (Mr. Stokes) did not see how he was able to accomplish this, unless he governed both his air-pump and his

gas-pump. Messrs. Beardmore had tried governing both gas and air, but found it more satisfactory, from the practical point of view, to govern only the gas. He thought the keynote of the paper was simplicity in gas-engine design.

M. Adolphe Greiner remarked that it was more than ten years since the late Mr. B. H. Thwaite and he opened the question of the gas-engine. He was now very glad to see that an Englishman had taken up the subject from another point of view; and perhaps the new vertical engine would supersede the horizontal one. If it did, it would be a great step in advance. The size of engine referred to by the author did not seem to him to be very large, as on the Continent they were now building engines of 3000 H.P. and several of 6000 H.P. But, after all, this was a question of fashion. On the Continent they did not like vertical engines; whereas in England they did. Mr. Chorlton had pointed out many of the defects of present-day large gas-engines. Cracks in cylinders were a difficulty which had now been overcome; but there were other difficulties which he had not noticed, but which he would no doubt perceive later on. For instance, most gas-engines were now made with crank-axles which had three or four bearings that were always a great source of trouble, especially as they wore out. It was for this reason that his firm built their engines without crank-axles, just as the Americans did; and he thought it was a good idea. Another great advantage which Continental makers secured was in passing the gases from the cylinders through a boiler. This gave an advantage of 8 per cent. efficiency.

Mr. Chorlton, in reply, said he did not agree with the last speaker's son that cracks did not occur in cylinders, and that there was no necessity to adopt a different style of cylinder. As to the horizontal engine being preferred on the Continent, this was so; and it was the same with the Diesel engine. This was now being made horizontal, which he thought was remarkable. M. Greiner, senior, who was one of the fathers of the large gas-engine, had made some interesting remarks about crank-shafts; and he (Mr. Chorlton) was very interested to hear that he had adopted the American practice, which had several things in its favour. In building horizontal engines, he had considered the matter on many occasions; but it seemed that it was giving away as much as was got back, and he thought there was very little in it. In the vertical engine, however, it was quite different, perhaps, because there was a containing bed which carried all the bearings in a form of spring box. Further, in the vertical engine, forced lubrication was adopted, and there was no wear on the bearings except to a very small extent. Consequently, the shafts were not in the least liable to get out of line, and there was not much danger of fractures. At the same time, it was good practice to work with a very large factor of safety in gas-engine crank-shafts. Mr. Lamberton had noticed something which many people would not have seen; and he was perfectly right. There was a tendency to get expansion through the connecting leg at the top. This, of course, was not so great as might be thought, because it was working within a water-jacket; and the rise in temperature in the jacket was probably not more than 50° as a maximum. Usually it was 30° in the normal engines. Mr. Lamberton had also referred to the bending-out of a casting when it was cooling. They had not, however, yet made very large ones of this type, and had not experienced any trouble in the distortion of the centre lines due to cooling. Mr. Lamberton's point in this connection was one of the most practical remarks on the design that he had heard; and he appreciated it. Mr. Stokes had given some of his experiences of the Oechelhaeuser engine, and also the form that his firm had recently got out, which was something like the one described in the paper. It was a curious thing—and he took it as a compliment—that another firm, quite independent in every way of his own, should have got out as nearly as possible the same design as he had done. It showed that people were realizing that it was necessary to make changes, and that experience was tending to guide these changes. With regard to the mixture in this engine, in the charging it was an advantage to govern the air and gas when dealing with a rich gas. With a normal gas, such as producer or blast-furnace gas, it was not worth while, because it increased the complication. The governing was after the Körting type of engine, because the charge was always held back until the last, whatever the capacity of it; and the result was that they always got right over the inlet cylinder at any load.

A hearty vote of thanks was accorded to Mr. Chorlton for his paper.

MACHINERY EXHIBITION AT OLYMPIA.

After an inspection of the exhibits, there is little doubt that visitors to Olympia between the end of last week and the 26th inst. (which is the closing day) will find themselves in full accord with the expression of opinion in the introduction to the Official Catalogue of the International Engineering and Machinery Exhibition—that the Machine Tool and Engineering Association, Limited, has completely justified its existence by this its first effort in exhibition promotion, and that the organization generally reflects great credit on the Managers. The 250 or so exhibitors occupy all available space, both upstairs and down; and it is calculated that on the ground floor there is machinery on view that weighs 5000 tons. A feature of the display, too, is the number of machines that are to be seen in operation. The productions of machine tool manufacturers naturally bulk largely; but other departments of mechanical engineering are also in evidence. Three weeks is not by any means too long for an exhibition of this character to remain open, considering the expense that must have been incurred by those taking part in it, and the large number of persons to whom such a show appeals. The most has, however, been made of the time at disposal by getting the whole of the arrangements completed in advance of the official opening, which ceremony was performed by Lord Selborne last Friday. A great effort has, we learn, been made to secure a big attendance of machinery buyers and users, especially from abroad; and it is satisfactory to reflect that these, as well as other visitors, will have their attention drawn to the possibilities of gas for lighting, heating, and power purposes.

Of the several stands that should be particularly referred to here, mention may first be made of that of Bonecourt Surface Combustion, Limited, of Parliament Mansions, Victoria Street, S.W. Here there is an opportunity offered to those who have not already done so of seeing in operation the system of surface combustion which has already been fully explained by Dr. W. A. Bone in lectures that have been reported at length in the pages of the "Journal." On the stand itself there are the porous diaphragms for giving out radiant heat. In the exhibition, coal gas and air is the medium employed; but it is pointed out that any inflammable gas can be used. The coarseness or fineness of the diaphragm (or fire-clay slab) is graded to suit the quality and pressure of the gas utilized, so as to secure the required results. For rich gases, like coal gas or water gas, there is the finer grade; while for poor gases and moderate temperatures, the coarser grade is available. Where the supply is under a pressure of about 2 lbs. per square inch, the gas may be made to draw in all the air needed for the proper mixture to obtain complete combustion; while with low-pressure gas, the air supply is provided by a fan or blower. The principal uses claimed for these diaphragms are: Evaporation of liquids by radiant heat thrown on to the surface of the liquid; concentration of sulphuric acid; industrial heating; and domestic heating, cooking, toasting, washing, drying, &c., particularly in hotels and large public institutions. In addition to this form of the surface combustion element (known as the "Diaphragm," or No. 1, process), there is to be seen in operation the "Cavity-Cobble" or "Granular Bed" (No. 2) process. The second form of the apparatus presents, it is remarked, an even wider field of application than the diaphragm process. Higher temperatures can be obtained by its aid, and the arrangement permits of the application of the process to all shapes and sizes of furnaces. The diaphragm is replaced by a bed of granular refractory material; and these granules can be packed in tubes for immersion in water or metals, or placed round a crucible, or be arranged in the form of a bed in a furnace. In addition to furnaces, &c., (the operation of the system in connection with which is demonstrated), this form of the process is, of course, as Dr. Bone has shown, available for steam raising; and in the yard outside the building there is a boiler which supplies power to one or two of the exhibitors. It is a ten-tube boiler, to evaporate 550 lbs. of steam per hour at 120 lbs. pressure; the gas and air being supplied under pressure by Sturtevant fans. The boiler is quite an attractive looking little thing, resting on cradles; the dimensions of it being 3 feet long between the end plates, and 2 feet in diameter. The tubes which contain the refractory material are of 3 inches bore; and, of course, the heat is developed right inside the water. It is not necessary to use all the tubes at one time. The net efficiency of the boiler and economizers, after deducting the power required to drive the blowers, is claimed to be over 90 per cent.; there being apparently practically no loss by radiation.

There is also a very good show of gas furnaces in action at the stand of Mr. S. N. Brayshaw, of Hulme, Manchester. These are fitted with his patent gas-burner, as supplied to the Royal Mint, and already described in our pages. This burner is suitable for coal gas or producer gas with air blast, or for compressed gas without air blast. There are crucible furnaces and a new type of hardening and annealing furnace, which is heated by gas entering through the roof. One advantage of this method is said to be that it gets the floor properly heated; while another thing is that it heats nothing but the actual place where the heat is required—there is no combustion chamber, or any possibility of waste. An interesting feature of this stand is the twin-chambered furnace, in which the upper chamber is heated by the waste heat from the lower one. This type is made in sizes to deal with the largest or the smallest work. The furnaces in operation can be tested by various pyrometers which are provided; there is an ingenious indicator for showing at a glance the amount of gas which is being consumed per hour. One of these indicators is fitted to a single furnace; and another on the main supply shows the total hourly quantity of gas being consumed at the stand. The Manchester Furnaces, Limited, make the third firm who exhibit gas-furnaces at work. They show two types, both of which are guaranteed as to temperature and uniformity of heat.

Modern gas-lighting is efficiently represented by the James Keith and Blackman Company, who exhibit their compressors and fans. The stand is illuminated by two single-burner inverted lamps of 1500-candle power each, and a three-burner lamp of 4500-candle power; the effect being disastrous to the appearance of neighbouring electric arc lamps. Near by the Sturtevant Engineering Company have a good display, which includes specimens of their air and gas fans and exhausters.

Meters and other recording apparatus of various forms are

represented. The Leeds Meter Company exhibit the "Clemesha Smith" recorder, for measuring the total consumption and rate of flow of water through the meter. There is a good display of the Cambridge Scientific Company's specialities, including the Callendar recorder, the Whipple temperature indicator, single and double thread recorders, thermo-electric temperature indicators, the Féry and Whipple-Féry radiation photometers, "H. and M." thermometers, and Rosenhain's fuel calorimeter. Messrs. George Kent, Limited, show the Venturi meter, with various designs of recorders; and Mr. Robert W. Paul and the Foster Instrument Company, pyrometers, &c. Messrs. Sanders, Rehders, and Co., too (in addition to pyrometers, fuel calorimeters, the "Sarco"—Beasley's patents—recording gas calorimeter, &c.), exhibit a new Kennedy type of pressure water-meter. This is made in sizes to register up to 14,000 gallons per hour; and it is guaranteed to be accurate within 2 per cent. A striking feature is its extremely quiet working.

Messrs. Kynoch, Limited, have a gas-engine of 100 B.-H.-P., working in connection with a suction gas plant; and there are a fair number of stands devoted to the acetylene and air-gas lighting interests.

DISTANCE IGNITION OF GAS-BURNERS.

The Grétzine Pressure-Wave System.

There has lately been published the specification of a patent taken out for France by the Société Française Grétzine for a device for lighting gas-burners by the pressure-wave system. The following particulars of the invention are translated from the specification.

Control of the different valves or cocks opening or closing the several gas-pipes is effected by means of two diaphragms—one to regulate the flow of gas to all the burners at the normal pressure (say, 52 inches of water) and the other to cut off communication with the first diaphragm and the valve serving the burners which are not to be lighted, or are to be extinguished when the pressure is increased to 60 inches.

The accompanying illustration shows how the invention is applied; figs. 1 and 2 being horizontal sections of the igniter, and the different positions of the various cocks.

Fig. 1.

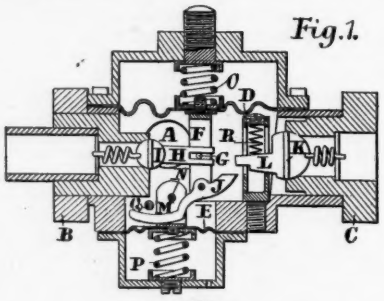
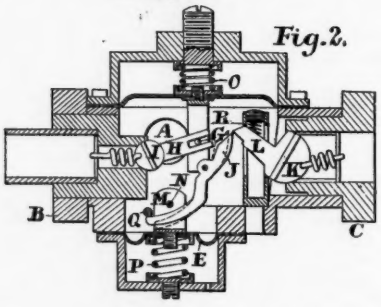


Fig. 2.



The gas reaches the igniter through the pipe A, and is conveyed to the nozzles B C; the former being connected with the burners which are to remain alight as long as the pressure in the mains is kept at the normal, and the latter leading to those which are to be extinguished by an increase of pressure. Fig. 1 shows an igniter in the position of rest; fig. 2 represents it after the application of the normal pressure. The igniter contains two diaphragms D and E. A rod F is fixed to D for opening and closing, by means of suitable mechanism (in the present case by the pin G and the fork H), the cock I leading to the nozzle B. On the rod F there is a double catch J, working on a hinge, and so arranged that it can act by the upper part upon the cock K, provided with a lever L, and closing the nozzle C; whereas the lower part is within range of the diaphragm E and the rod M connected with it, and provided with a rod N for shutting.

In the position shown in the illustrations, the two passages B and C are cut off from the flow of gas. If gas is conveyed into the igniter at a pressure of 52 inches of water, the two diaphragms D E are forced outwards. The springs O P counteract this; and the effect is that the diaphragm E remains temporarily in about its initial position. The rod F, however, is moved with the membrane D, and the cocks I and K are opened; the former being brought into the position shown in fig. 2 by means of the rod G and the fork H. The cock K is opened in the following way: The hinge of the double catch J is moved by the rod F, and the lower part brought against a fixed point of support Q in the box. The pivot continuing to advance causes the upper part of the catch to turn on Q, which participates in the forward motion of the rod F. The upper part of the catch consequently engages behind the lever L, and moves the cock K into the position shown in fig. 2. The two passages B and C are then brought into communication by the flow of gas through the nozzle A, and the burners connected with it are ignited by the pilot-lights. If pressure greater than the normal is exerted, the spring P is compressed under the action of the diaphragm E. The rod N, connected with it, is consequently pushed outwards against the lower part of the catch J, which is moved a little farther towards the diaphragm E. The result is to make the catch turn sufficiently to release it from the lever (the position shown by the broken lines in fig. 2). Under the action of the spring R, which presses on the lever L, the cock K, left to itself, closes, and extinguishes the burners connected with the nozzle C. Whether the pressure is only momentary or permanent is a matter of little consequence. It is only when the pressure falls below the normal that the diaphragm D returns under the action of the spring O. The cock I shuts again, and the mechanism assumes the position shown in fig. 1.

With this invention, it is necessary that the diaphragm E should serve only to keep the cock K away from the influence of the diaphragm D; and the mechanism to effect this can, of course, be modified in many ways.

THE THEORY OF WATER HEATING.

By J. Pater Wiatt.

The writing of this article is the outcome of a realization of some misconception existing among certain sections in the gas industry with regard to water heating. This misconception is due, I believe, to only a partial knowledge of the real relation of the gas burnt to the water heated.

In the first place, let us be clear about what actually takes place when water is raised in temperature by the combustion of gas. This is a very elementary point. To put it simply, it is merely transferring the heat (measured in thermal units) generated by the combustion of gas to the water which comes within the zone of its hot gases. The number of British thermal units contained in a cubic foot of gaseous fuel is determined during the process of the manufacture of the gas used, and cannot therefore under ordinary atmospheric conditions be increased. We must be careful, however, to avoid confusion between British thermal units (B.Th.U.) and temperature which is measured in degrees. A British thermal unit is the measure of the amount of heat a body contains, while temperature is merely the measure of its intensity. Or, to put the latter more simply still, temperature is a method of ascertaining how closely the heat units are "packed" together—it is analogous to pressure in gases; whereas British thermal units can be compared to mass, or how much gas a given chamber contains.

It is most important before going further to have a perfectly clear conception of temperature and thermal value, because only by a proper understanding of their relations can confusion of ideas be avoided. In heating water, flame temperature (the number of degrees of the flame) is not considered. What is of importance is the thermal value (calorific value) of the gas per cubic foot, because it is these units which have to be "placed," so to speak, in the water; and by transferring them to the water we raise its temperature. It will be seen that the rise in temperature of the water is, therefore, determined by the number of heat units transferred to the water from the gas, and not by the temperature of the flame. We have so to arrange our water-heater that the minimum of resistance is offered to the passing of the heat from the flame (or hot gases) to the water; the flame being reduced in temperature (or becomes less "packed" with the units) and the water increased (or more "packed" with the units).

The number of British thermal units in a cubic foot of gas varies in different undertakings, but is usually somewhere between 550 to 600. So knowing this, it is quite easy to discover how many units are required to heat a given quantity of water x degrees, more especially when we realize that one B.Th.U. will raise 1 lb. of pure water 1° Fahr. (39·1° to 40·1°), and that a gallon weighs practically 10 lbs.

Let us take an example. We wish to discover how many British thermal units are required to raise 30 gallons of water through 40° Fahr. The formula is written as follows:—

$$\text{B.Th.U.} = \text{W.S.} \times (T - t).$$

Where W = Weight of water in lbs.
S = Specific heat (water = 1).
T = Final temperature.
t = Initial temperature.

The above formula will apply not only to water, but will enable one to ascertain the number of British thermal units required to raise any substance (so long as the specific heat is known) through x degrees.

The same formula, when applied to water only, can be simplified; and this rendering is the one advised:—

$$\text{B.Th.U.} = G \times 10 \times D.$$

Where G = Gallons.
10 = 10 lbs. to gallon.
D = Number of degrees raised.

Now let us work out the example enumerated above—viz., the number of British thermal units required to raise 30 gallons through 40° Fahr. Substituting the values for the letters, we get the following:—

$$\text{B.Th.U.} = 30 \times 10 \times 40 = 12{,}000 \text{ B.Th.U.}$$

If the number of cubic feet consumed is required, the formula is written thus—

$$\text{B.Th.U.} = \frac{G \times 10 \times D}{V.}$$

Where V = calorific value of gas (taking C.V. 600 B.Th.U.)

$$\therefore \text{B.Th.U.} = \frac{30 \times 10 \times 40}{600} = 20 \text{ cubic feet}$$

It must be remembered that the above result is purely theoretical, and that it does not take into consideration any heat which may have been lost. So that although there is enough heat in 20 cubic feet of gas to raise 30 gallons through 40° Fahr., since there is a certain amount of the heat lost without doing useful work the actual quantity would be above 20 cubic feet in ratio to the efficiency of the heater.

The application of mathematical formulæ will also be found very useful in testing the efficiency, &c., of a water-heater; and the following formula will be found especially useful, as it gives the actual result. The question of where the heat goes, how it is lost, &c., does not matter for the moment in a test of this description. What we are out to discover is its working efficiency. The formula in percentage is as follows:—

$$\text{Percentage of efficiency} = \frac{G \times 10 \times (F - I) \times 100}{C \times V.}$$

G = Gallons.
F = Final temperature of water discharged.
I = Initial temperature.
C = Cubic feet used.
V = Calorific value of gas in B.Th.U.

The method of test is as follows: Take the initial temperature of the water (say, 50° Fahr.), set the heater in operation, measure the amount of gas consumed during the test (say, 36 cubic feet), and the quantity of water heated (say, 30 gallons), and take final temperature of water (say, 110° Fahr.). The calorific value of the gas = 550 B.Th.U.

We will, from the above figures, by substituting them for the letters in the formula, obtain the following:—

$$\text{Percentage of efficiency} = \frac{30 \times 10 \times (110 - 50) \times 100}{36 \times 550}$$

$$\therefore \text{Percentage of efficiency} = \frac{30 \times 10 \times 60 \times 100}{36 \times 550} = 90.\dot{9}0$$

The above answer gives us the percentage of efficiency; and by subtracting this result from 100, we arrive at the percentage of loss (9.09) due to various causes. It will also show the percentage of heat units and cubic feet used and dissipated. In this formula, it will be noticed that no allowance has been made for heat lost by the water after leaving the heater due to radiation, or the loss due to the conductivity of the vessel into which the measured water flows. This is not necessary, as its purpose is to give a true result of what actually happens under ordinary working conditions.

The following table shows the amount of cubic feet required to heat *x* gallons through *y* degrees. These figures are the theoretical quantity required; but when the percentage of efficiency is once known, the actual number of cubic feet can be arrived at for *x* quantities raised through *y* degrees. The table is worked out at 600 B.Th.U. per cubic foot.

TABLE *Showing, in Cubic Feet, x Gallons Raised y Degrees.*

Gallons.	Degrees.				
	20.	30.	40.	50.	60.
5	1·6̇	2·5	3·3̇	4·16̇	5
10	3·3̇	5·0	6·6̇	8·33̇	10
20	6·6̇	10·0	13·3̇	16·66̇	20
30	9·9̇	15·0	19·9̇	24·9̇	30
40	13·3̇	20·0	26·6̇	33·33̇	40
45	15·0	22·5	29·9̇	37·49̇	45

For 600 B.Th.U. per cubic feet.

It is hoped that the foregoing formulæ and figures will have shown the value of the application of simple mathematics to the question of water heating. It is the only way by which we can hope to arrive at true and exact conclusions; and, when once thoroughly grasped, it will be found to be applicable in a variety of ways, and will always help us to understand in the clearest manner what is really taking place.

BRIDLINGTON WATER WORKS AND SUPPLY.

At a Meeting of the Institution of Municipal and County Engineers recently held at Bridlington, a paper furnishing particulars of the water works and supply of the town was read by Mr. SIDNEY CHARLESWORTH, the Deputy-Chairman of the Water Committee of the Corporation. The following are extracts from the paper, with notes of some of the remarks made upon it.

The first record of a public water supply in Bridlington refers to the discovery, in 1811, of an ebbing and flowing spring in the harbour (at a depth of 43 feet), by Mr. Benjamin Milne, Collector of Customs. He had a reservoir made and a pump fixed at his own expense; and this supply is still used by the shipping frequenting the port, as well as by the local fishermen. Some time after the work had been finished, Mr. Milne wrote to the Lords of the Manor asking them to make him a grant towards the expense he had incurred for the public good; and he seems to have found them very unwilling to help him.

In 1865, a number of local gentlemen formed themselves into a Company, under the title of the Bridlington and Quay Water Company, Limited, with a capital of £20,000. They supplied the town for ten years without obtaining an Act of Parliament. Then, with the assistance of the Urban District Council, they obtained an Act with clauses facilitating the purchase of the undertaking by the Local Authority, and increasing the authorized capital to £40,000. In the year 1899, the water undertaking was acquired by the Town Council; the amount paid for it being £70,000. The loan period was fixed at fifty years, and the money was borrowed at 3¼ per cent. The cost of the arbitration—£2000—was shortly afterwards repaid out of the water-works revenue. The author was elected on the Council on Nov. 1, 1905; and he immediately raised the question of the inefficiency of the pumping machinery to meet the needs of a growing town like Bridlington. On Jan. 23, 1906, the Water Committee were empowered to call in expert advice; and Mr. F. J. Bancroft, B.Sc., M.Inst.C.E., of Hull [now the Engineer of the Barnet District Gas and Water Company], was asked to inspect and report.

In his report, Mr. Bancroft fully endorsed the author's contention that the old plant was out of date, wasteful in coal consumption, and dangerously inadequate for the work required of it. He strongly recommended the immediate installation of a modern pumping-engine in duplicate. This the Council decided to do, and prepared to apply to the Local Government Board for permission to borrow the money. It was then discovered that though the Bridlington Water Company's Act gave the Council power to purchase the undertaking and to borrow the money for the purpose, once it became their property, they had no authority to raise loans for any further developments. It was necessary, therefore, to amend the Act; and this was done by a Provisional Order obtained in 1908.

The old works consisted of two stations, the upper and the lower. The latter was erected in 1865, at a height of 100 feet above Ordnance datum. The area of the site is 1¼ acres. The works consist of engine and boiler house, fitting-shop, manager's house, and office, and a disused reservoir. There is a well 6 feet in diameter and 100 feet deep. This station has been abandoned for purposes of obtaining a water supply. The portions which have been retained are the well, the boiler-house (now used for storing coal), the engine-house, which will be converted into a store-room and workshop, and the reservoir. The old engine and pumps have been broken up and sold, and the boiler converted into a soft-water feed-tank. This we find a most useful adjunct, as it allows soft water to be used for make-up instead of using hard well water.

For several years it had been the custom to run both stations continuously night and day seven days per week to supply the town during the height of the season. Anyone conversant with water supply will realize the enormous risk we were incurring in so doing. It was most difficult, however, to convince some of the members of the Council and ratepayers of the absolute necessity for new plant. But fortunately we were able to get the new machinery working from the deepened well before the record dry season of 1911 set in; otherwise the results to Bridlington as a health resort would have been disastrous. Owing to the fact that the new engines had to be fixed over the existing well, and that the lower station could not alone supply the town, the difficulty of installing the first set was considerably increased. The new boiler and engine house having been erected, one-half of the well curbing was removed, along with one set of pumps and gearing; the remaining half being then securely strutted and braced to the new dividing-wall. The delivery-pipe from the remaining pump which had to be used was diverted, to allow the first set of foundations to be put in and its engine erected thereon. Our Works Manager (Mr. W. Gibson) deserves credit for devising and carrying out this difficult piece of work.

The original specification prepared by Mr. Bancroft called for a duplicate steam-driven plant, capable of easily pumping 1000 gallons of water per minute at normal speed; the speed of the pump to be not more than 120 feet per minute, and capable of working smoothly and regularly at half-speed, and also at 30 per cent. above normal. The engines to be designed to work most economically from a depth of 180 feet, and to be capable of pumping from a depth of 200 feet. The same conditions were specified for the suction gas and electricity tenders. The average of the

tenders for steam and suction gas plants came to about £8500. Tenders for the electrically-driven plant averaged about £8000 each, with travelling crane and all accessories.

The merits of the three systems were thoroughly discussed by the Water Committee, and it was eventually decided to adopt a steam-driven plant, on account of its flexibility and reliability, especially when used for well-sinking and drifting, which had to be done with the new machinery as soon as it could be installed. The contract for the complete plant was placed with Messrs. Hathorn, Davey, and Co., of Leeds, as follows: Two complete compound horizontal differential surface-condensing pumping-engines, cylinders, 18 inches and 36 inches diameter respectively, each with two pump-buckets 17⅛ inches diameter, with a common stroke of 4 feet for engine and pumps; two Cornish boilers, 6 feet diameter by 24 feet long, with a grate area of 18 square feet each, and a working pressure of 100 lbs. per square inch; two M'Phail-Simpson superheaters, each with 350 square feet of heating surface; one Green's economizer, with 48 pipes; a small engine for driving scrapers; two feed pumps; and one 10-ton overhead travelling crane. The makers guaranteed that each engine, with its boiler and accessories, when pumping at the rate of 1000 gallons per minute against an average head of 180 feet (the amount of best Yorkshire screened steam coal used having an evaporative capacity of not less than 9 lbs. of water per pound of coal from and at 210° Fahr., with superheated steam at 100 lbs. boiler pressure and a vacuum of not less than 27 inches), should not exceed 186 lbs. per hour; and when pumping a similar quantity, under the same conditions, against a total head of 160 feet, the fuel consumption should not exceed 172 lbs. per hour. This guarantee was fulfilled by both engines at the trial; and we have every reason to believe that the consumption under ordinary every-day working conditions has not greatly exceeded the guaranteed amount.

As soon as both main engines were completed and had worked long enough to show that all was in order, the well-sinking and adit-driving were undertaken. The original depth of the well was 160 feet. This was lowered to 193 feet, and two adits were driven, each being 50 feet long. The contract for this work was given to Messrs. B. Robinson and Son, of Hull. This work took four months to complete, working double shifts. The town had to be supplied with water partly from this well; and the surplus water was discharged into the sewers in various parts of the town.

The Local Government Board have only allowed us fifteen years in which to repay our loan on the new pumping-engines. One of the old engines (which was not specially designed for pumping) actually ran, and the boiler was in use, for more than forty-five years. The cost of coal saved by putting in new engines is equal to the amount of principal we have to repay annually; the interest being paid out of revenue. The coal used by the new plant is one-third of that required by the old. Our water consumption works out at 43 gallons per head per day for all purposes. In the height of the summer season, however, this is considerably increased. The metered supply is 10 per cent. of the total.

The water is very pure, but rather hard. This, however, can be overcome by boiling that which is used for drinking, when the temporary hardness of 15·2 degrees is reduced to 2·1 degrees permanent hardness. The water, after being boiled and allowed to cool, does not taste flat or insipid. Our water charges are 1s. in the pound on the rateable value; one closet, 10s.; extra closets, 5s. each; bath, 5s.; water by meter, 1s. per 1000 gallons. It is the intention of the Water Committee to reduce materially the charges on closets and baths at the end of the present financial year. The income from the water-works has increased by about 25 per cent. since the Corporation acquired the undertaking; and last year the equivalent of a 2d. rate was handed over from the profits towards the reduction of the district rate.

Discussion.

Mr. E. J. Silcock (London) asked if the author could tell the members what the maintainable revenue of the Water Company was before the Corporation purchased the works, and whether the amount of compensation included any extra payments for back-dividends, overspent capital, or anything of the kind. One could not help seeing the Corporation had been most successful, from the financial point of view, in conducting their water-works. To be able to carry them on for a charge of 5 per cent. on the rateable value of the premises supplied, and to hand over to the relief of the rates a sum equivalent to 2d. in the pound, showed that the undertaking was economically managed.

Dr. H. T. Calvert said that the water supply of Bridlington appeared to be derived from a well in the chalk, and to be rather hard. He should like to know whether the Corporation had considered the question of softening the water. The removal of every degree of hardness corresponded roughly to a saving of soap of about 1 lb. per 1000 gallons. The present figure of hardness was about 15 degrees; and it could be reduced to 2 degrees by treatment with lime. This would mean a considerable saving of soap. Had any difficulties been experienced as a result either of growths or corrosion in the pipes?

Mr. J. P. Wakeford (Wakefield) said that the consumption of 43 gallons of water per head per day seemed excessive, having regard to the fact that there were no manufactories or trades in Bridlington. They were not told whether Deacon meters were in use; but he could not help thinking that a large amount of the consumption was preventable waste. He had had experience of the meters mentioned, and had found that they enabled a saving up to 40 per cent. to be effected.

Mr. J. H. Smillie (Tynemouth) thought Bridlington was to be congratulated on the success of the water undertaking. It did, however, appear to him that in such a place the use of 43 gallons of water per head per day was excessive. He ventured to say the time would come when the Corporation would have to consider how they should reduce the quantity. He would not like to say the consumption could be reduced 50 per cent.; but 30 or 40 per cent. should mark the decrease under a proper system of surveillance. Even then, with 25 or 30 gallons per head per day, the people would be very well supplied.

Mr. Charlesworth, in reply, said it was the intention to reduce the charges for baths and water-closets very materially. It had not been a question of making money out of the ratepayers by these additional charges, but a necessity. The Water Company were paying 15 per cent. dividend when the Corporation bought the undertaking. They knew they would get a very good price for the works, and they did. With regard to Dr. Calvert's suggestion as to introducing softening plant, he knew that in York they strongly objected to having their water doctored; they did not like chemicals being put into it. This was one reason why they had not gone in for softening in Bridlington. With a very soft water, there was action on the service-pipes, and the consequent risk of lead poisoning. By boiling the water, they got it practically as soft as Leeds water. As to the excessive consumption, he had been a strong advocate for reducing it; and he was pleased gentlemen had spoken out as they had done. The consumption was far in excess of what it should be. As to corrosi on, they could show Dr. Calvert some pipes put down forty years ago which were practically in as good condition as when they were laid.

WEAK AMMONIACAL LIQUOR FOR PURIFYING GAS.

One of the papers submitted to the Eighth International Congress of Applied Chemistry, which was held in Washington (D.C.) last month, was on the subject of "The Continuous Purification of Coal Gas with Weak Ammoniacal Liquor;" the author being Mr. J. G. O'Neill. The following abstract of the communication is taken from the current number of the "Journal of the Society of Chemical Industry."

The gas leaving the condensers is washed with weak ammoniacal liquor instead of with gas liquor in the first scrubber, whereby the whole of the cyanogen is absorbed, and also the greater part of the hydrogen sulphide. The temperature of the gas and of the wash liquor should not exceed 30° C. The wash liquor from the scrubber is returned to the ammonia still, and the impurities saturate the concentrated ammonia in the condenser of the still. The following are typical data of the process:

	Nov. 11.	Nov. 22.	Dec. 5.	Dec. 7.	Dec. 14.	Jan. 2.
Gas liquor supplied to ammonia still . . { NH_3 grammes per litre . .	7·00	5·27	4·25	3·87	6·15	7·00
{ H_2S " " . .	3·20	2·49	1·98	2·31	3·57	3·20
Wash liquor taken from ammonia still . { NH_3 " " . .	7·48	6·93	5·50	4·79	5·98	8·48
{ H_2S " " . .	1·46	1·12	0·68	0·74	0·80	1·46
Wash liquor from first scrubber. . . . { NH_3 " " . .	7·48	6 83	5·84	5·03	7·82	9·18
{ H_2S " " . .	6·12	6·00	3·80	4·43	6·13	8·17
Grains of H_2S per 100 cubic feet of crude gas before scrubbers	807·80	703·80	592·10	703·80	557·00	966·90
" " " " " " after "	276·40	96·30	33·60	44·00	25·00	30·60
Thousands of cubic feet of gas washed per hour	45	40	35	37	45	44
Gallons of wash liquor used per hour	720	815	700	900	600	900
Grains of H_2S absorbed per gallon of wash liquor	314	298	279	270	399	574

Mr. E. Grant Hooper, the Superintending Chemist at the Government Laboratory, and the Vice-President of the Society of Chemical Industry, has been appointed Deputy Government Chemist, in succession to Mr. H. W. Davis, who has retired.

The "City of Birmingham Gas Department Magazine" for this month contains a letter addressed to the Secretary and Manager of the Department (Mr. R. S. Hilton) by Mr. Wastell, the new Secretary of the South Suburban Gas Company, sincerely thanking him and the staff for the valuable tangible expressions of their good-will towards him, of which he was the recipient at the gathering of the staff on the 10th ult., to which reference was made in the "Journal" the following Tuesday. He says he will prize them above most of his other cherished possessions; and he hopes to keep in touch with the department for the rest of his life.

CAUSES AND PREVENTION OF BREAKAGES IN WATER-PIPES.

Last winter, after five serious breaks had occurred in the large mains of the water-works system at Detroit (Mich.), Mr. George H. Fenkell, the Engineer to the Board of Water Commissioners, undertook an investigation into the causes of the trouble and its prevention. The report of his findings and recommendations was submitted early in the year, and was supplemented by a report by Professor Gardner S. Williams. Both reports deal with the history of the damage to the mains, discuss possible causes, and conclude that water-hammer is responsible in large measure for the breaks.

According to a summary of Mr. Fenkell's report contained in "Engineering Record," there have been sixteen breaks in 42-inch mains since 1898; and of the entire number four have occurred in December, four in February, three in March, one in each of the months of January, April, July, August, and September, and none in May, June, October, and November. The trouble, therefore, appears to be seasonal in nature, with an entire absence of breaks during spring and autumn, a limited number during the summer months, and eleven out of sixteen, or 68 per cent. of the total, during December, February, and March.

All 42-inch mains laid prior to 1902 were 1·2 inches thick, and since that date 1·4 inches thick. If cast iron is assumed to have a tensile strength of 18,000 lbs. per square inch, the older pipes should withstand 1018 lbs. pressure per square inch, and the new ones 1200 lbs.; and, allowing a factor of safety of 6, the older pipes would sustain safely a working pressure of 170 lbs., and the newer ones of 200 lbs., per square inch, or more than double those actually applied, as indicated by pressure-gauges.

Many years ago, several large relief-valves, each fitted with ball and lever and similar to large safety-valves, were installed to relieve the pressure in case of water-hammer. Large air-chambers are placed in each pump; and as these chambers are the best appliances known for reducing water-hammer, a chamber having a capacity of 1000 cubic feet was installed in 1907, and directly connected to 42-inch mains. This chamber was put in service Jan. 8, 1908, and reduced the ordinary vibration in pressure on each of these mains from 10 lbs. to about 4 lbs.

There is a difference of about 40° Fahr. between the summer and winter temperatures of the water which flows through the mains. The expansion and contraction of a 12 feet length of pipe for this change amounts to nearly 0·036 inch, or quite an appreciable quantity. As far as Mr. Fenkell has been able to determine, the cities which have the most trouble with breaks during the winter time are those in which the pipes are subjected to the greatest range of temperatures. The range in Detroit varies but little from year to year; for, no matter how cold the winter may be, the temperature of the water at the intake during January and February of any year will be very nearly 32°. If expansion or contraction alone caused many breaks, they would occur regardless of the severity of the winter.

Mr. Fenkell concludes that several of the reasons for breaks which he had discussed could have played but little, if any, part in causing the damage that he had been investigating. There are other proposed causes which, though not sufficient in themselves to cause breaks, did probably contribute their share towards producing extraordinary stresses in the pipes. Among these may be mentioned cooling strains in castings, flaws in pipes, strains due to difference in temperature between water and earth, the effect of frost, and settlement of foundations. But while these probably contributed their share towards bringing about the final result, and while the same combination probably did not exist in each case, the deciding influences are believed to have been water-hammer, due to the high consumption and the expansion and contraction through temperature changes.

In order that water-hammer may be reduced to a minimum, it is recommended that two 6-inch safety relief-valves be installed in connection with each of the six force mains, or twelve in all, in addition to those in service at present; and that three additional air-chambers, each having a capacity of at least 1000 cubic feet, should be constructed and put in service. These safety appliances will, it is believed, reduce the number of breaks to a minimum. It is further recommended that the pumpage of water through a 48-inch main should be limited to a maximum rate of 35 million gallons, and for a 42-inch main to 23 million gallons per day.

In his report, Professor Williams says the causes of breaks are shocks set up by the rapid change of velocity in the pipes. These shocks may proceed from the engines when speeding-up, or more often when two or more deliver water at the same time, and from the simultaneous closing of many small connections or the shutting of gates in large mains. A break which occurred on the 6th of July last was in all probability due to the closing of a 30-inch main continuing a 42-inch main which failed at almost the exact time that the shut-off was made.

The higher the velocity of the water in the mains, or the greater the quantity being delivered, the more dangerous are the effects of the shocks. In cold weather, the resistance to strain, and especially to shock, on the part of iron is appreciably reduced, which in part accounts for the fact that 16 out of 31 in which the date is given, or more than 50 per cent., occurred in the four months of freezing temperatures. The analyses of the metal from recent breaks show the phosphorus content to be near the upper allowable limit, and indicate weakness against shock.

Among the preventive measures to be applied, as suggested by Professor Williams, are the provision of more mains—thereby reducing the necessity of forcing such large quantities of water through the pipes, and of having several engines delivering into the same main; the installation of air-chambers, to protect certain districts of the water-works system; when laying large pipe on soft ground, the filling of the bottom of the trench and the encasement of the lowest quadrant of the pipe with concrete. He adds that the existence of a reservoir connected to the distribution by mains of large capacity would also reduce the likelihood of breaks, and be desirable as a reserve in case of accidents.

UNDERGROUND GASHOLDER TANKS.

A CONSULTING gas engineer who has had considerable experience in gasholder construction has noticed in the "JOURNAL," and also in the evidence given at the inquiry in connection with the gasholder accident at Ilkeston, a tendency to attach too much importance to what he says may be termed the "factor of safety myth." He remarks that the only stresses referred to, or of which any calculations were submitted, were the very ordinary ones due to the water pressure in the tank. The stresses induced by the holder towering high above the tank level were practically ignored, with the exception of the evidence given at the eleventh hour by Mr. Doig Gibb. It was simply suggested that because the tank failed with a factor of safety of $3\frac{1}{2}$, this should be increased to 4. But our correspondent says the $3\frac{1}{2}$ has reference to the water pressure stresses only, and has nothing to do with the stresses induced by the superstructure. To increase this to 4 is, he considers, "mere quackery," because it is assuming that the stresses derived from the superstructure are always one-seventh of those due to water pressure, when one has nothing whatever to do with the other. It takes no account whatever of the height or the construction of the holder, nor advances any reason in support of it; and he sincerely trusts that neither we nor the Government Inspector will base our observations on such unsound principles of construction. Referring to the Porth tank (referred to in Mr. Thomas's paper in last week's issue), our correspondent expresses the opinion that in all bad ground, liable to subsidence, no gasholder tank should be allowed to stand above the ground level—at any rate, not more than a few feet. He says it is almost impossible to foresee what stresses the structure may be called upon to resist. The risk, therefore, is too great where lives are at stake.

Award to the Brentford Gas Company.

The Brentford Gas Company have been awarded the Gold Medal by the International Jury of the Latin-British Exhibition for heating. The circumstances under which the award was made are distinctly interesting. A large firm have an exhibit showing the manufacture of an article of every-day use. For the purpose of this manufacture, a temperature of 110° Fahr. is required, and it is essential that this temperature should be raised quickly and afterwards maintained constantly. Some difficulty was experienced by them in obtaining the heat required. The Company were then consulted on the matter. As a result, three Wilson circulators were installed, and an excellent result was obtained. The circulation is so arranged that either one, two, or three circulators can be used; further, the whole of the exhibit, or a part only, can be warmed. It is a piece of work thoroughly creditable to the gas industry, and it was appreciated by the Jury, who saw the working of the installation.

During the months of July, August, and September, the Road Board, with the approval of the Treasury, made advances amounting to £172,703 from the Road Improvement Fund to county councils and other highway authorities. Of the total, £136,724 was for road crust improvement. The grants for this purpose up to the 30th ult. amount to £662,150.

We learn from Mr. J. Alsop, the Hon. Secretary of the Manchester Junior Gas Association, that the first of the series of lectures arranged to be delivered in the Manchester University this season, will be given next Saturday by Mr. E. J. Evans, B.Sc. (Mon.), who will take for his subject "The Physics of the Incandescent Mantle." Mr. Samuel Glover, the President of the Manchester District Institution of Gas Engineers, will occupy the chair.

At St. Peter's Church, Norton, Malton, last Wednesday, the marriage was solemnized of Mr. John Bernard Cattle, the Secretary and Manager of the Martock and District Gas Consumers' Company, Limited, and Miss Ethel P. Wallgate, eldest daughter of the late Mr. Staveley Wallgate and Mrs. Wallgate, of Norton. The bridegroom is the second son of Mr. G. Simpkin Cattle, the Clerk to the Malton Urban District Council; and after serving his apprenticeship with Mr. Henry Tobey, the Engineer, Manager, and Secretary of the Malton Gas Company, he was appointed Manager at Martock.

REGISTER OF PATENTS.

Production of Nitration Products from Coal Tar.

SILBERRAD, O., of Buckhurst Hill, Essex.

No. 13,861; June 10, 1911. No. 712; Jan. 9, 1912.

This combined invention relates to the preparation of difficultly volatile nitrated products which remain liquid at ordinary temperatures; the patentee having found that the neutral liquid portion from the middle, heavy, and anthracene oils obtained from tar, after suitable chemical washing, produce on nitration, under suitable conditions, a mixture of nitro compounds, possessed of very low vapour tension, and which remain liquid at ordinary temperatures.

His invention therefore consists in the production of such an oily nitration product by subjecting a coal-tar product of the kind referred to to nitration under suitable conditions. But more specifically his invention consists in the production of such an oily nitration product from any liquid neutral fractions of oils boiling between about 200° to about 350° C.—that is to say, the liquid portions of middle, heavy, and anthracene oils—of creosote oil, including the various sharp oils, the residues from the manufacture of carbolic acid, cresol, naphthalene, and anthracene, and also coal tar lubricating oil. In this connection, he finds that the highest fractions—*i.e.*, the portion boiling from about 270° C. to about 350° C.—do not so readily lend themselves to the treatment described; so he prefers to utilize oils of which at least the greater portion boils from 200° to 270° C.

The desired fractions are freed, if necessary, from phenolic bodies, bases, and objectionable impurities (if any) by washing with alkali and acid in the usual manner, and in this way obtaining the neutral portion—the degree of importance of this chemical washing varying with the nature and the purity of the product required, and of the fraction of tar oil to be dealt with.

In order to effect the nitration, the tar oil (after having been submitted to such chemical washing as is desirable in the usual manner) is run into a nitrating vessel fitted with an efficient stirring apparatus and suitable cooling coils or jacket, and brought into a state of violent agitation. The desired amount of nitric acid is slowly run in; the temperature being carefully controlled by circulating water through the coils or jacket—the mixture being violently agitated the entire time. After the full amount of nitric acid has been added, sulphuric acid, sufficient to cause the completion of the reaction, is run in; very special attention being directed to the efficiency of the agitation and to the control of the temperature throughout the whole operation. The mixture is then allowed to stand overnight, and the oil is separated, and washed with water and dilute sodium carbonate in the usual manner.

In carrying the invention into effect, according to one example a suitable still is charged with creosote oil containing the residue from the manufacture of carbolic acid and naphthalene; and the fraction boiling from 200° to 270° C. is collected. After freeing the distillate from any naphthalene which separates out, it is subjected to chemical washing with alkali and acid in the well-known manner, using sufficient alkali to remove all phenolic bodies in the first place, then water, then sulphuric acid, then dilute alkali, and finally water again.

In effecting the washing, it is found convenient to subject the oil to a thorough washing with 2½ to 5 per cent. of concentrated oil of vitriol, and to repeat this operation until the desired degree of purity is obtained; 5 to 20 per cent. of acid being used in this manner. After washing, the oil is again distilled; and the fraction boiling between 200° to 270° C. is again collected, allowed to stand, and freed from any further quantity of naphthalene which separates. The oil is now ready for nitration.

To effect this, 100 lbs. of oil is run into a suitable nitrating vessel fitted with an agitator and cooling jacket; then 68 lbs. of nitric acid (sp. gr. 1·50) is slowly run in; and finally 88 lbs. of sulphuric acid (sp. gr. 1·84) is gradually added. During the whole operation the contents of the vessel are kept in violent agitation, and the temperature is kept at 20° to 35° C. After the full amount of acid has been added, the mixture is allowed to stand for about sixteen hours; the nitrated oil is separated from acid, and washed with water and dilute soda carbonate in the usual manner; and it is then ready for use.

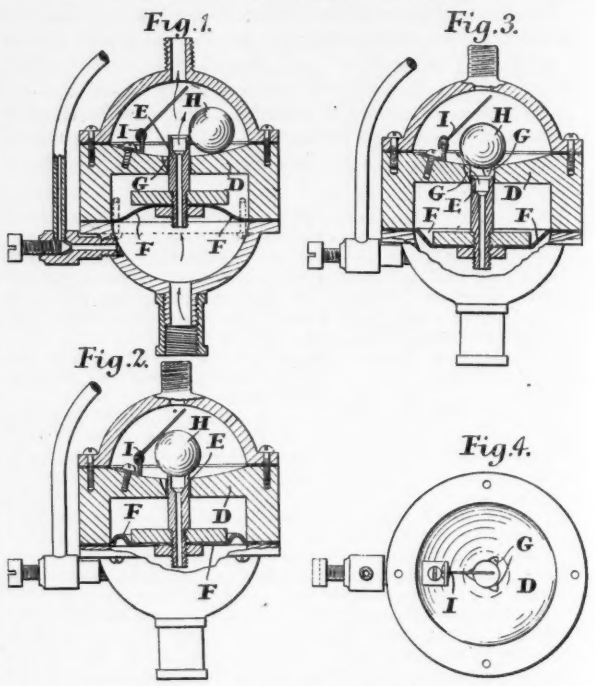
According to another method, the nitration may be carried out as follows: 1000 parts by volume of sharp oil, boiling between 200° to 260° C., is run into a suitable nitration vessel fitted with an agitator and cooling jacket. A mixture of 100 parts by volume of nitric acid (1·5 sp. gr.) with 25 parts of water is gradually run in. Then 100 parts by volume of nitric acid, previously diluted with 10 parts of water, is gradually added. Then 100 parts by volume of nitric acid, previously diluted with 5 parts of water, is gradually added. Then 100 parts by volume of nitric acid is gradually added. Finally, 150 parts by volume of nitric acid, previously mixed with 450 parts of C.O.V. by volume, are gradually added. During the whole operation the contents of the vessel are kept under violent agitation, and the temperature is maintained between 20° and 35°C. during the addition of the acid. The mixture is allowed to stand overnight, and is then gradually warmed to 60° to 70° C. under stirring. The oil is then separated, and washed with water and dilute soda carbonate in the usual manner.

Lighting and Extinguishing Street Gas-Lamps.

HUTTON, E. C.; a communication from J. Brazier, A. J. Bedford, and E. Wood, of Melbourne.

No. 20,831; Sept. 20, 1911.

The patentees propose to project upwardly from one face of a flexible diaphragm a tubular seating which rises and falls and so operates in and through a valve opening or socket provided centrally in a partition having a dished upper surface and formed at one end of, but integrally with, the gas-cylinder. An upward or downward movement is given to this tubular seating when acting in conjunction with the flexible diaphragm; and it also serves to admit gas to the burner for lighting the street lamps between sunset and midnight when the gas pressure is high, or it may be employed for admitting gas to the burners for lighting purposes between midnight and daylight, when the gas pressure is comparatively low, or as a means, in conjunction with a metallic ball, for cutting off the gas supply to, and extinguishing the light at, the burner at daylight when the gas pressure has again been increased.



An Australian Gas Lighting and Extinguishing Device.

Fig. 1 is a sectional elevation of the governor under full pressure; fig. 2 shows it under half pressure; fig. 3, under low pressure; while fig. 4 is a plan of the controller with the upper cover-plate removed.

The lower controller comprises a cylinder with dome-shaped cover. The gas entering the lower part of the controller passes from the upper part to the burner; the bye-pass being connected to the lower cover. The upper part of the cylinder is provided with a dished plate or partition D dividing the upper from the lower chamber. Within the lower chamber a tubular valve seating E is mounted on a flexible diaphragm F, which is clamped between the cylinder and cover. This valve seating projects through a hole G in the plate D, and is adapted to rise and fall with variations of pressure. Above the plate a ball valve H is provided, which normally covers the hole G, which is notched around its edge to allow the passage of a small amount of gas. A wire guard or stop I is also mounted on a small bracket to displace the ball from its seating when the seating is raised by the increase of pressure.

The operating of the controller is effected entirely by the pressure of the main supply of gas. In fig. 2, the controller is shown with the passage to the main burner closed; the pressure of the gas being about 30-10ths—just sufficient to keep the tubular seating E pressed against the ball-valve H. To light the burner to the full extent, the pressure is raised to about 40-10ths, thus causing the seating to rise until the ball-valve H is displaced, as shown in fig. 1. In order to obtain a restricted supply of gas to the burner, the pressure is lowered to about 18-10ths, when the seating falls below the surface of the plate and allows the passage of a small amount of gas between the ball H and the plate D, as in fig. 3.

Thermostats.

YATES, H. J., and HARVEY, F., of Birmingham.

No. 27,215; Dec. 5, 1911.

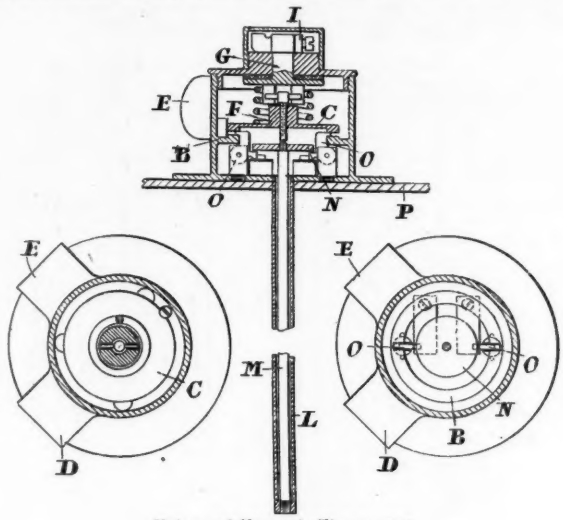
This invention relates to thermostatic valves employed for regulating the flow of gas to the burner of a gas-heated boiler, so that the full flow of gas is maintained to the burner until a predetermined temperature is reached in the heating apparatus, and when such temperature is attained or exceeded the gas supply is either suddenly reduced to a small amount or is entirely cut off.

A sectional elevation is given of one form of the thermostat; also a sectional plan of the device, showing the valve in position, and a similar view with the valve removed.

The thermostat consists of a valve chamber formed with an annular valve seating B for a disc-like valve C. The seating and valve divide the interior of the chambers into compartments for the inlet and outlet of the gas. One of the sockets D communicates with one compartment and the socket E with the other. A peripheral lip is formed on the underside of the valve for co-operating with the seating and the controlling elements. The valve F is screwed to permit adjustment of the valve; and in conjunction with the stem there may be arranged a rotatable operating element G, which projects beyond the cap of the valve chamber to permit of adjustment of the valve (by means of the finger grip-piece I) at any time without opening the chamber. By means of a spring placed on the upper or outer side of the valve C, the latter is pressed towards or upon its seating.

The thermostat comprises a pair of ordinary concentric elements L and M—the outer one L being secured at one end to the valve-box and

at the other end to the inner element M; while the latter at the extremity within the valve-box is free. The free extremity preferably abuts when cold against the inner end of the valve-stem F. At or near the free extremity of the inner element M there is a collar N, which can abut simultaneously upon one end of each of a pair of bell-crank



Yates and Harvey's Thermostat.

or like levers O, which at their other ends occupy positions between the valve and its seating, so as to keep the valve open against the action of its spring, as in fig. 1. The thermostatic elements for the greater part project into a convenient portion of (say) the boiler P. When the temperature of the boiler increases, the ends of the levers O are gradually withdrawn in a transverse direction from between the valve and its seating; but as they remain in contact with the valve, they do not permit the latter to close or materially affect the flow of gas to the burner. When the temperature is such that the levers are moved past the inner edge of the lip on the underside of the valve, the valve is immediately closed under the action of its spring.

When it is desired not to completely interrupt the gas supply on the attainment of a given temperature in the boiler, but to pass only a restricted quantity of gas to the burners, the valve-stem F is made of such a length that the central thermostatic element M can act as an abutment therefor. When the apparatus is cold, the stem and the central element are in contact; but as the temperature increases, the central element separates from the stem. By adjusting the stem, it can be arranged to again abut upon the central element after the valve has been released by the levers, but before it is quite closed by its spring. If further increase of temperature occurs, the small aperture is further regulated by the ordinary action of the thermostatic elements and the spring acting on the valve.

Regenerative Gas-Generating Furnace.

STETTINER CHAMOTTE-FABRIK AKTIEN-GESELLSCHAFT vormals DIDIER, of Stettin, Germany.

No. 14,702; June 24, 1912. Convention date, July 10, 1911.

The specification of this patent points out that the waste gases which escape from the heating conduits of the retort or chamber furnaces used in the manufacture of gas are of much higher temperature than in the case of coke-ovens or furnaces. With regard to the higher temperature of waste gases from gas-generating furnaces, the arrangement of regenerators usually employed for imparting preliminary heating to the combustion air presents difficulties in these furnaces. An immediate transfer of the waste gases, for instance, from a gas-generating retort-furnace with constant direction of the heating flame alternately into the regenerators connected to the heating conduits of the furnace is inexpedient, as the control or change-over parts or valves which must be inserted between the heating conduits and the regenerators would not be able to withstand for any length of time the high temperatures of the waste gases or of the air highly-heated by the latter. For this reason, regenerators have not been adopted for recovering heat in the case of gas-generating furnaces, although they work considerably more economically than the usual recuperators.

It is true, the specification continues, that it has been already suggested to make possible the use of regenerators in chamber furnaces for the manufacture of lighting gas by working the chamber furnaces with alternate direction of the heating flame, in which case, of course, the control or change-over parts for the highly-heated waste gases, or for the combustion air heated by the same, become unnecessary, as control or change-over parts for the waste gas and the air have to be provided only at the point where the waste gases, after having exchanged heat with the air, escape from the regenerator. This construction, has, however, the drawback that the process of gasification in the furnace chambers with alternating direction of the heating flame cannot be carried out in such a uniform and economical manner as is required for ensuring a good yield of gas and producing coke of high value. Moreover, in the working of such chamber furnaces with alternating direction of the heating flame, there is the drawback that single parts of the furnace masonry specially exposed to the highly-heating gases, are prematurely destroyed.

The object of the present invention is to provide a gas-generating furnace—more particularly a chamber furnace—with constant direction of the heating flame, in which the above drawbacks are obviated by the waste gases (escaping from the heating conduits) being cooled before their admission into the regenerators, in recuperators built in front of them, to temperatures which enable suitable control or change-over parts to be used without risk of their premature destruction.

This construction is more particularly suitable for all those cases in which gas-generating furnaces are heated by a heating gas produced at a distance—for instance, from central generators, or by blast-furnace gas and the like. The highly-heated waste gases are caused in this case to exchange heat in the recuperators with the heating gases, which are thereby raised to the ignition temperature required for their combustion. This construction thus offers the double advantage that, on the one hand, a favourable preliminary heating of the heating gas is effected by the waste gases of the furnace, and, on the other hand, the waste gases are brought to a sufficiently low temperature in order to make practically possible the use of change-over parts at the inlet of the hot waste gases and at the outlet of the highly-heated air.

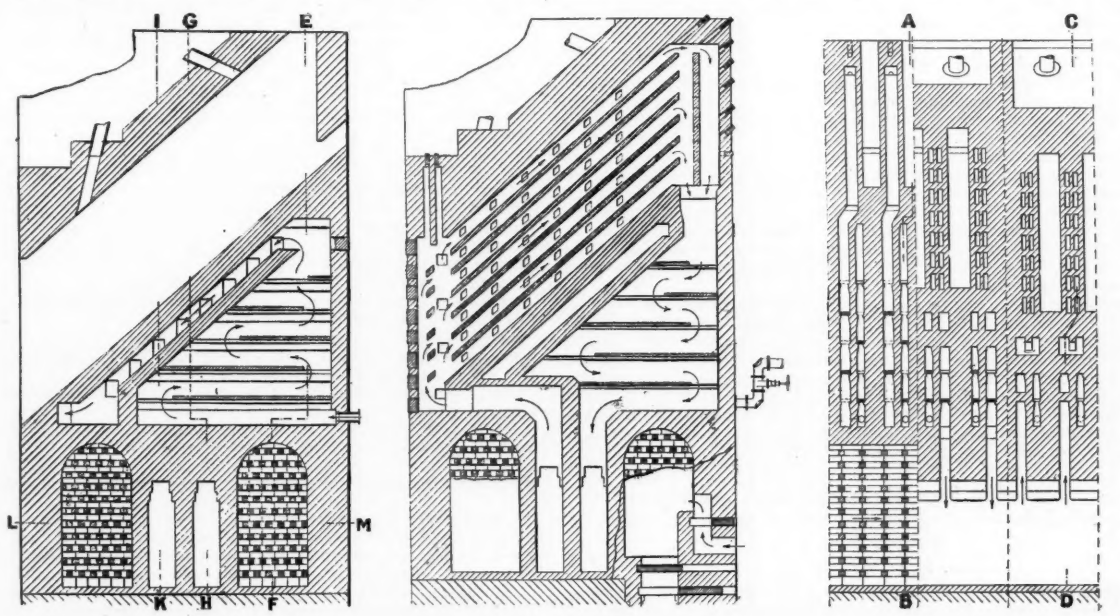
A furnace with oblique chambers is illustrated (by way of example) in vertical section on the line A B; in vertical section partly on the line C D; and in various vertical sections through a portion of the furnace—namely, to the left on the line E F, in the centre on the line G H, and to the right on line I K.

Valves for Gas-Purifiers.

CLAPHAM, T. A., of Keighley.

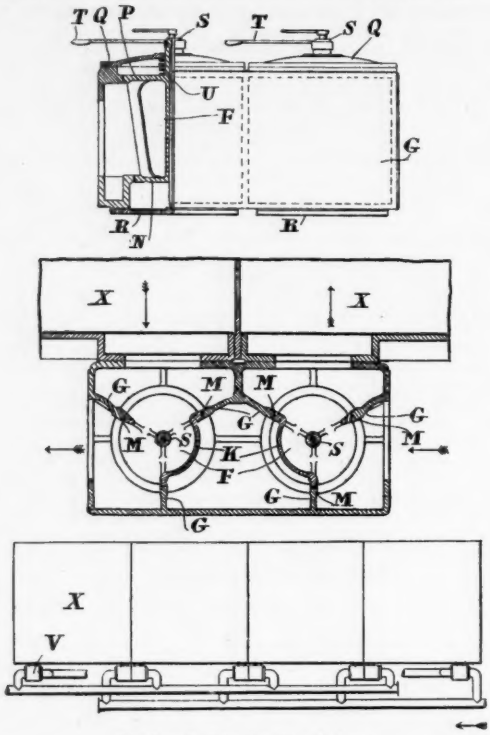
No. 11,355; Nov. 13, 1911.

This invention particularly relates to valves of the rotary type employed in connection with gas-purifiers and which are arranged to have the axes of the openings for the admission and emission of the gas at right angles to the axis of the valve. Many forms of valves of the type have been heretofore employed, the patentee points out, but in all cases the radial vanes or wings have acted as stops or guides for the gas passing through the valve; whereas in accordance with the present invention openings are made in the radial vanes or wings, two of the latter of which are joined together by a separate wall, preferably concentric with the centre of rotation of the valve, so that the wall may



A New Type of Stettiner Furnace.

cut off or divert the passage of the gas, while the third acts merely as means for guiding the valve and for forming a gas-tight joint with the wall of the valve chamber against which it moves—this construction of valve allowing the gas a greater amount of freedom for its passage through it than is the case with valves of ordinary construction. The invention further consists in the application of a spring device for holding the valve upon its seat, combined with screw-actuated means for moving the valve away from its seat when it is to be operated.



Clapham's Gas-Purifier Valves.

In the arrangement shown, a hollow plug F is arranged to rotate within a barrel so that its peripheral edges have openings which permit the gas to pass within the plug, but by radial partitions coupled together by walls K the gas is guided as required. The partitions are so arranged that their outer edges M, terminating in the periphery, occupy positions which divide the periphery into three equal parts with the upper and lower end walls of the plug in the form of discs N P, which enable the plug to act as guiding means in one direction or the other as it may be adjusted. The chamber within which the plug rotates is formed so that the edges of the partitions or projecting portions G, extending from the inner walls of it, form surfaces for engagement with the edges of the partitions of the plug. The edges correspond exactly with the partitions, so that when the edge of one partition is brought into contact with the edge of another within the chamber, the other two edges will make a gas-tight joint.

The peripheral edges of the partitions are of tapering form; one being arranged to fit the other in order that gas-tight joints may be produced, while also the discs N and P at the lower and upper extremities of the plug have their peripheral edges tapering to fit the tapered circular openings through the walls of the chamber, while a cover Q and base piece R, secured to the upper and lower walls of the chamber, enclose the chamber and the parts within. By this arrangement, and by allowing the axial shaft S of the plug to pass through the upper cover Q, the handle T may be secured on it, and the spring U may be mounted within the chamber and to take over the shaft S, so that one end of the spring may press against the cover Q while the other will force down the plug into its position within the chamber—thus at all times enabling the plug to produce the gas-tight joint required.

These plugs may be arranged in single chambers as at V having three openings leading therein, or they may be arranged in pairs within the same chamber, which has two openings leading into, or from, each portion of the chamber, with an opening leading from one chamber to the other. In this case, three passages are formed through the walls of the chamber for the passage of the gas as controlled by the valve when fixed in position.

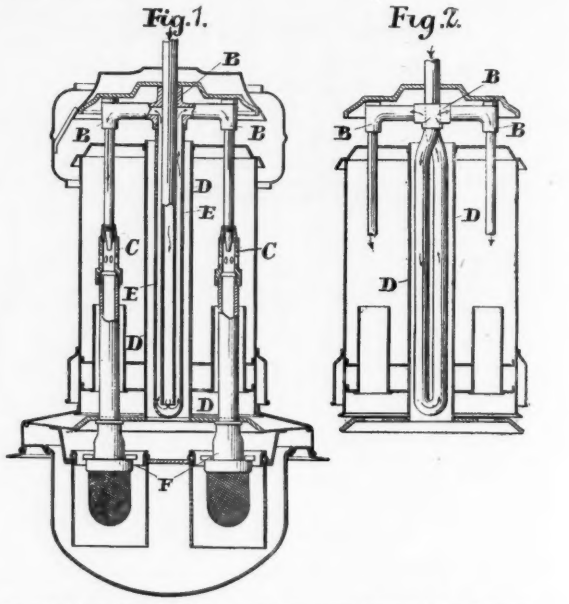
In making use of this type of valve, there are arranged, in conjunction with each purifying chamber X, through which gas has to be conducted, two of such valves; so that when the chambers are adjoining each other the double valve or the valve having two plugs within one and the same chamber may be situated at the joining of the two sets of apparatus, or by appropriate pipe connections such arrangement may be varied. This mounting of two valves in one casing adjoining two chambers has been heretofore proposed to be used in connection with other forms of gas distributing valves.

Inverted Incandescence Gas-Lamps.

NEW INVERTED INCANDESCENT GAS-LAMP COMPANY, LIMITED; a communication from CARL REISS, of Berlin.

No. 6073; March 11, 1912.

This inverted incandescence gas-lamp is of the kind in which the gas, previous to entering the burner, is caused to take a circuitous path down to below the air opening in the bunsen tube, and so become preheated prior to entering the burners; the object being "the provision of improved means for effecting this preheating . . . to obtain a better combustion, and a higher luminosity, than have heretofore been possible with this kind of lamp."



Reiss's (New Inverted Gas-Lamp Company) Inverted Gas-Lamps.

In fig. 1, the gas supply pipe passes down through the union B and extends to a point below the level of the air-orifices in the bunsen tube C—"it being essential that the gas should always flow down to a point below these orifices." Surrounding the portion of the gas supply pipe lying within the chimney D is a tube E, which is closed at the bottom. The gas issues at the lowermost end of the supply pipe, and then ascends the tube E, and enters the union B, from which it flows into the bunsen tubes C, and thence to the burners F. Thus, owing to the circuitous path along which the gas is compelled to travel before reaching the burners, it becomes highly heated by the heat transmitted from the flue D (and the hot products of combustion) to the cylinder or tube E, and will, in this condition, enter the burners "at such a temperature as to promote proper combustion and ensure a high luminosity."

According to the arrangement shown in fig. 2, the gas supply pipe also passes down through the union B, but is then bent upwards and opens into the union; the pipe being, at the same time, enclosed by the chimney D, and extending down to a point intermediate the lower end of the chimney and the level of the air orifices in the bunsen tube. Through this bent pipe the gas flows - heated in its circuitous course by the hot products of combustion passing up the flue D. The tube E is here dispensed with. If desired, the gas supply pipe may be carried down to the bottom of the chimney, as shown, so as to be in close proximity to the burners, and "so ensure a greater amount of heat being transmitted to the gas in its circuitous path."

APPLICATIONS FOR LETTERS PATENT.

21,640.—PESEK, J., "Automatic gas attachments." Sept. 23.
21,641.—MARTIN, J., "Contrivance to indicate whether an invisible lamp is burning or not." Sept. 23.
21,663.—CROSLAND, F., "Prepayment meters." Sept. 24.
21,748.—MEYENBÖRG, A., "Pipe joints." Sept. 24.
21,777.—LYNDE, F. C., "Mantles." Sept. 25.
21,785.—HELPS, G., "Gas-lamps." Sept. 25.
21,810.—YATES, H. J., and DAVY, J. F., "Gas and coal fires." Sept. 25.
21,835.—ZEITLER, J., "Gas motor." Sept. 25.
21,912.—M'COURT, C. D., and BONECOURT SURFACE COMBUSTION, LTD., "Locomobile steam-generators." Sept. 26.
21,928.—RIDSDALE, J. W., and PENDLEBURY, H., "Indicating and recording apparatus." Sept. 26.
21,991.—WADDELL, A., "Treatment of coal, shale, or the like, in vertical retorts." Sept. 27.
22,061.—BAXTER, S. S., "Artificial fuel." Sept. 28.
22,062.—KENT-JOHNSTON, A. G., "Controlling the lighting and extinguishing of gas-lamps." Sept. 28.
22,075.—JACKSON, J. P., "Gasholders." Sept. 28.
22,095.—WRIGHT, ALEX., AND CO., LTD., CARR, H.O., and NAIRNE, U. O. S., "Apparatus for heating water." Sept 28.
22,121.—KREUTZIGEN, W., "Operation of gas-taps from a distance." Sept. 28.
22,136.—M'KINLAY, R., "Governing engines and motors employed for forcing gas and air through mains." Sept. 28.

Reduction in Price at Tyldesley.—The Gas Committee of the Tyldesley-with-Shakerley Urban District Council have recently reduced the price of gas by 2d. per 1000 cubic feet for lighting and 3d. for cooking—making the present net prices 2s. 11d. for lighting and 2s. 8d. for power and cooking, with a further discount to large users. The price to prepayment meter consumers is 3s. 4½d. for lighting only, and 2s. 11½d. for lighting and cooking.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

"Competition Points for Gas Salesmen."

SIR,—In your issue of the 1st inst., I notice an article by Mr. Bezant, in which he deals with the digest of a book entitled "Competition Points for Gas Salesmen," which he has just written. I would, with your permission, like to call attention to one or two remarks he made, which, in my opinion, are not quite accurate. He says: "What is original is the scheme of the book. Nothing of the kind has been previously prepared." And later in the article, he says: "Something has been attempted here that has not been attempted before."

Now this is not so. In a book which I wrote in 1907—entitled the "Sale of Gas Apparatus"—I dealt with a great deal of the matter which Mr. Bezant deals with in his article. My book was subsequently published from the "JOURNAL" office; and, as you may remember, I received the proofs in February, 1908. The work was shortly advertised for sale in the "JOURNAL."

In the book I am referring to, I dealt with the following: The style of knowledge required by the gas salesman; the chemistry of combustion and the products of combustion; thermal units and their relation to temperature; candle power; gas and electricity compared; explanation of electrical units; gas cookers, fires, burners, brackets, condensing, and steam radiators, lighting, gas-engines, &c., &c.; are gas-fires healthy, and why ventilation, &c. Besides these, there were many other items that it is essential for a gas salesman to thoroughly understand, if he wishes to successfully compete with his "power and lighting" rivals. I also gave the explanation why an incandescent burner, though giving off no carbon in combustion, had a tendency to blacken the ceiling, and methods of preventing it.

I have written the above to you, as I think I can justly claim to be the pioneer in this class of literature as applied to the gas industry; and while I wish Mr. Bezant's book every success—for works of this description are sadly needed—and also welcome its arrival from such a well-versed and facile pen, I feel sure he will readily admit, after investigation, that what I have said above is correct.

His remark *re* "catalogue knowledge," is similar to the one I made in the first chapter of my book; and several other remarks bear a like resemblance. I do not suggest plagiarism in any form, but merely that Mr. Bezant is labouring under a delusion.

Holloway, N., Oct. 3, 1912. J. PATER WIATT.

[Had Mr. Wiatt done me the honour of expending 3s. 6d. upon my book, and had further paid me the compliment of perusing its contents, he would not, I venture to think, have written the above letter. Extensive as has been my exploration into the work and literature of the gas industry, I must confess that I had not before his letter was received opened the covers of a single copy of Mr. Wiatt's little book entitled "The Sale of Gas Apparatus." I have, since reading his letter, done so, with the result that I am happy to say that I am fortified in the belief I formerly held that the scheme of my book is original, and that never before has such a mass of information of value to the gas salesman been brought together in one pair of covers. A large part of the sixty pages comprising Mr. Wiatt's "Sale of Gas Apparatus" deals with matters that do not come within the purview of the scheme of "Competition Points for Gas Salesmen" to which my name is attached as author and compiler; and the area of ground covered is only in small measure touched upon in Mr. Wiatt's book. Our methods of treatment are altogether different. And permit me to remind Mr. Wiatt that long before his book saw the light of day (the year on the title page and at the foot of his preface is 1910, and not 1908), thousands of copies of a series of leaflets entitled "Illuminating Truths," written by me, had been distributed by many gas undertakings in this country and the colonies, and there are many other matters in his book that were formerly dealt with by my pen in another form and place. I cannot consent to Mr. Wiatt taking away any credit that may attach to me on the score of originality in connection with the scheme of the book; and those who are in possession of his book and mine will have no difficulty in determining how far this endeavour to degrade my claim is justified. It would be absurd on my part to occupy further space over the point which has arisen from want of knowledge, and a hasty determination without seeing the book itself. May I, in concluding this note, take the opportunity of thanking those engineers and managers who have already written me letters of appreciation, which are most encouraging.—THE AUTHOR AND COMPILER OF "COMPETITION POINTS FOR GAS SALESMEN."]

Flues, or No Flues, and Escaping Heat Units.

SIR,—We are sorry that we are compelled to again ask you to allow us a little space, through the non-compliance with our request of Sept. 24 to Messrs. John Wright and Co., for reasons for their (what we consider to be arbitrary) statement in an article appearing in your issue of Sept. 3.

The statement you and your readers will remember is that "a fire that carries off all its products without being attached to a flue will, when the ordinary chimney draught comes into play, inevitably carry off more than the products—to wit, an unnecessary number of heat units as well." As this statement was intended (and we think unfairly as trade competitors of Messrs. John Wright and Co.) to depreciate the new standard of hygienic efficiency that we have set up, as well as the "Shadowgraph" method of testing that has been devised by the aid of our technical staff at the Luton works, we must urge them, in common fairness and justice, to give their reasons for the statement with as much publicity as they chose to adopt in making it.

If they still decline to endeavour to qualify their statement, it will be necessary for us to ask your further indulgence to pursue the matter in the cause of scientific gas-fire construction, and in the interests of the gas industry generally.

DAVIS GAS-STOVE COMPANY, LTD.

59, Queen Victoria Street, E.C., Oct. 5, 1912.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Chairman's Reference to "Journal" Correspondence.

The Half-Yearly Meeting of the Alliance and Dublin Consumers' Gas Company was held in the Company's Office, D'Olier Street, Dublin, on Monday, the 30th ult.—Alderman W. F. COTTON, M.P., the Chairman, presiding.

DIRECTOR'S DIFFICULTIES.

The CHAIRMAN, in moving the adoption of the report and statement of accounts [see "JOURNAL" last week, p. 57], remarked that the results of the half-year's working, having regard to the difficulties experienced by the Directors in this period, had taken him by surprise. During the six months ended on June 30 the work had been most laborious, owing to the coal strike. It was found impossible to obtain delivery of the coals contracted for. The Directors having failed, after using every possible exertion, to get the usual supplies, they were obliged to resort to the open coal market, and purchase sufficient, in their judgment, to guard against any failure in the supply of gas. This, of course, one would have expected, would lead to additional expenditure; and so it did. The coals purchased cost the Company £5828 in excess of contract prices—viz., 25s. per ton, as against 14s. However, on reference to the coal account it would be found that the cost per 1000 cubic feet of gas sold did not exceed the price for the corresponding period. This was attributable to the new carbonizing plant, and the attention paid thereto by the Directors and staff of the Company. All obstacles were overcome without any inconvenience whatever to the public, as regarded a full supply of gas for both lighting and fuel purposes.

THE STRIKE QUESTION.

Any person of common sense must deplore these unnecessary strikes. In his opinion, disputes should be referred to arbitration for settlement. By adopting such a course, the unfortunate men would be spared the humiliation of having to apply for charity for the purpose of sustenance for their wives and families, which had been the case in numerous instances. The working of the mines had on many occasions been so bad that coals were not brought to the surface of the pits. Notwithstanding, however, that they were often short of supplies, no occasion arose when the supply of gas to the city had to be curtailed.

THE ACCOUNTS.

Referring to the accounts, he said the receipts for residuals showed an increase; but the chief increase, as already stated, was in the make of gas per ton of coal carbonized, which was about 1700 cubic feet more than formerly. A glance at the coal account showed that they came out of the half year without any increase in the cost of this commodity. The additional make of gas per ton of coal carbonized in Dublin made up for the increased cost of coal. Nevertheless, but for the strikes, the profits would have been £5828 better. There was still a quantity of coals to be delivered under last year's contracts, and, in addition, they had about 10,000 tons in stock, besides a contract to run for another twelve months at the old prices. He feared that in the near future they would have to keep a larger stock of coals in store to guard against strikes. This would lead to additional expense, as coals, when kept in store, deteriorated; and there was, in addition, the cost of shifting from the store to the retort-house.

COMPETITION.

Progress during the June half year, notwithstanding the disadvantageous circumstances they had had to contend with, had been highly satisfactory. Most of them were aware that there were three local authorities in competition with the Company—each supplying electric light, and supporting its electricity undertakings, until lately, out of the rates. These authorities had left nothing undone to deprive the Company of their customers—not with any advantage to ratepayers. The Company had added £10,381 to capital. The larger portion of this sum had been expended on automatic installations, which involved the laying of service-pipes, and also the supply of meters and fittings, cookers, brackets, and pendants.

HEATING AND COOKING.

During the half year there had been put in 1838 new installations, in each case fitted with cooker, pendant, and brackets. There were also 96 cookers supplied to houses which had not been supplied with gas beyond a service to the cooker. There were let on hire 787 cookers and 290 heating stoves; and 4 cookers, 73 heating stoves, and 9 gas-fires were purchased by consumers. He was glad to say that the public were awaking to the fact that the cheapest fuel for heating and cooking was gas. During the coal strikes there was a considerable demand for all descriptions of gas apparatus for cooking and heating. There were in use on June 30 last: Free cookers 34,560, slot cookers purchased 104—total, 34,664; hired cookers 6532, model cookers purchased 323—total, 6855; heating stoves on hire 2281, heating stoves purchased 3463, fires purchased 659—total, 6403; and other heating apparatus, 62. The Chairman remarked that he would be pleased to answer any questions in connection with the accounts. He was aware that it often occurred that at meetings of proprietors many details were asked for which, subsequently being published, had on many occasions

been used against the Company. He was of opinion that it was right and proper that the fullest information on everything connected with the Company should be given to the proprietors; but this information could always be obtained at the Company's offices.

CRITICISM IN THE "JOURNAL."

The Chairman then proceeded to deal with the letters which have recently appeared in the "JOURNAL" criticizing the Company's affairs. On June 22, he said, the Board directed the Secretary to address the following letter to the Editor of the "JOURNAL:"

> Sir,—The attention of the Directors of the Alliance and Dublin Consumers' Gas Company has been called to the anonymous letters which have appeared in the "JOURNAL OF GAS LIGHTING" with respect to the depreciation of the shares of the Company; and while anxious to afford shareholders every information, they do not feel called upon to enter into a discussion in the columns of the "JOURNAL." At the same time, any communication addressed to the Secretary and Manager from a shareholder will receive the immediate attention of the Board, and the whole subject will be dealt with by the Directors in due course.

The Board decided, after very careful consideration, that it was not in the interests of the proprietors to carry on a discussion in the "JOURNAL" with an anonymous correspondent. Dealing with the principal point made by the gentleman who had written many letters over the name of "Nonulus," he quoted the following: "Failure to correct the capital expenditure in past years must necessarily overshadow other factors, because, whether the revenue account is administered efficiently or not, this bugbear of high capital ratio remains."

THE CAPITAL RATIO.

The Chairman admitted that the capital ratio was high; but the question he would like to put was—and it was one which had constantly been before the Board—How could this have been avoided? In 1909, the Company promoted a Bill in Parliament to adopt the use of the No. 2 "Metropolitan" burner, to obtain powers for further capital, &c. The severest opposition was raised by the local authorities in the district of supply, especially the Dublin Corporation, and many days were spent in cross-examination of the Company's witnesses on this very point. Nevertheless, the Company were able to justify the capital before the Committees in the House of Lords and House of Commons, and to obtain their Bill—it having been proved by their witnesses that, having regard to the amalgamation of the many different Companies which eventually combined in the Alliance and Dublin Consumers' Gas Company, the enormous district of supply, which was sparsely populated, and many other reasons, owing to local conditions which he need not specify, the capital charges were not unreasonable.

COMPARISONS.

"Nonulus" drew comparisons between London and Dublin. But the Chairman thought it was obvious that it was impossible to compare two districts where the whole conditions of supply were at variance, and that, in order to make a fair comparison, he must find a gas undertaking which, in all respects, was supplying gas under the same conditions as those in Dublin. For instance, the difference in freight on coal shipped to Dublin as compared with London averaged about 2s. per ton; and the same applied to practically all material used by the Company. Then there was the question of the number of consumers per mile of main, which the correspondent appeared to have altogether overlooked. When the Company were in Parliament, figures were given in evidence, showing that whereas the London average was 258 consumers per mile of main and suburban companies 179, in Dublin it was only 78. As no doubt they were aware, as the number of consumers per mile of main was reduced, the cost per 1000 cubic feet of gas increased, and *vice versâ*. Perhaps the shareholders would more readily appreciate the point when they considered that the Company had to lay three miles of main to every mile laid by London to obtain the same number of consumers, and, furthermore, to bear the cost of upkeep, which would be somewhat in the same proportion. Of course, since the passing of the Act in 1909 the number of consumers per mile of main had considerably increased; but this was due to slot installations, involving, in every case, considerable capital outlay. Even taking the figures up to date, with the increased number of consumers, the actual consumption per mile of main was only 2,264,000 cubic feet, as compared with the average in London of 10,226,000 cubic feet.

WORKING RESULTS.

Referring to the results of the Company's working since the passing of their Act in 1909, the Chairman said that prior to the passing of the Act the Dublin Corporation had extended their boundary. Under the Boundaries Act, they had taken over the districts of Clontarf, Glasnevin, and Drumcondra; and they contended that, as these districts were now in the city, the differential rates that applied before the taking over of these areas should cease. The Board felt that there was considerable justification for this argument, and that the Parliamentary Committees might take this view. But then there were two other local authorities (Rathmines and Pembroke) which were considerably nearer the city than the "added areas"—Pembroke being within 640 yards and Rathmines 1·25 mile, as against Drumcondra and Clontarf 2·25 miles, in addition to which these districts were more densely populated. The Board felt they could not maintain the differential rates in the Rathmines and Pembroke areas; and that, having agreed to give them the Dublin rate, they could not shut out the important districts of Kingstown and Blackrock. In fact, they felt themselves coerced into allowing the Dublin rate practically over the whole area of supply, which resulted in a deficit in the receipts of £10,000 per annum to the Company. In addition to this, the Company undertook to reduce the price of gas by 3d. per 1000 cubic feet on the Dublin rate for three years. These two items came to £28,000 per annum reduction in the Company's receipts. Nevertheless, the Company had ever since been able to maintain their usual dividend.

PRICES OF MATERIAL.

The prices of coal and oil, and practically all material, had risen, and there had been a general increase in wages, together with the cost of working the Insurance Act. Very heavy expenditure had also been incurred in advertising and pushing the sale of gas, rendered necessary in consequence of the increasing competition with the three principal local authorities in the district, who had supported their electric light undertakings, until lately, out of the rates—the Gas Company being one of the largest ratepayers. Indeed, he did not think any gas undertaking of the same size was spending more on this branch of the business. The system adopted by the Board some years ago, of looking after consumers' burners and fittings free of charge, had been followed by many of the large companies. Gas cookers, fires, and practically all appliances were sold or let on hire on easy terms; and no charge was made for the fitting-up of them except where there was an excessive run of piping. A staff of canvassers was employed in connection with this department; large and extensive show-rooms, which were being added to, were maintained in the principal business street of Dublin; and recently the Company had engaged the services of an experienced lady demonstrator in connection with gas cooking, as it was their intention to have a staff of trained ladies to visit consumers' houses, where required, to explain the best methods of using the cooker. At present they had 50,000 slot consumers who had been supplied with free cookers and fittings, in addition to which each slot consumer was supplied with an incandescent burner, mantle, and globe, free of charge. He was happy to say that the demand for slot installations still continued.

HIGH-PRESSURE AND MANUFACTURE.

Several high-pressure gas plants had been installed in the City recently, and were giving the greatest satisfaction; and he had no doubt that when the public had gained some experience of this method of lighting large buildings, factories, warehouses, and shops, they would find it undoubtedly superior to anything that could be done with electric light, and would return to the use of gas. Turning to the manufacturing side, he mentioned that a new retort-house had been completed at the Dublin works, with regenerative furnaces and De Brouwer's stoking and discharging machinery. The coke was handled by coke-conveyors, which took it from the retort-house and deposited it on the coke floor. New cranes and grabs were on order for discharging the steamers, and there only remained the question of deciding the best method of conveying the coal from the steamer into stores to complete a thoroughly up-to-date and efficient plant.

DEPRECIATED SECURITIES.

Having regard to all these factors, why, he asked, had the value of the Company's stock depreciated? His answer was that all securities had depreciated—such as railway companies, banks, breweries, &c. On this point, he quoted a number of Irish railway and other securities and the prices at which they stood in 1900 and 1912 respectively—considerable depreciation being shown in each case.

Mr. CHARLES LAWLER, J.P., having seconded the motion,

Mr. H. E. JONES said he had listened to the Chairman's statement with great interest. He had spent forty years of his life in London, was Chairman of the Gas Companies' Protection Association, and had experience of working in many countries—in India and Argentina, for example—and he felt at full liberty to say that the comparison which had been made by the Company's critics between the Dublin Company and the London enterprises was ridiculous. In Dublin, they served an enormous area with a small quantity of gas compared with that sold in London. As the Chairman told them, it only amounted to one-sixth part. Therefore, they must have six times as much mileage of mains, and they had the cost of upkeep, inspection, and collection over this large area. They also had in Dublin some 50,000 slot consumers; but they consumed very little gas in the aggregate. These were a great boon to the working classes; and in this respect the Gas Company were practically benefactors. Inasmuch as the total number of consumers was only 67,000, and as they had this enormous proportion of slot-meter consumers, they would see how very expensive it was to the Company to distribute gas. On the selling price of the gas it cost them nearly double what it cost the London and Suburban Companies and the best towns and corporations. Then, again, they had very strong competition fed by the rates, to which they themselves contributed. He was bound to say that it had become almost time to pass an Act of Parliament in the interests of the ratepayers to stop this squandering of the ratepayers' money, to which large ratepayers like the Railway Companies, the Tramway Company, and the Gas Company must contribute. The ratepayer forgot that he himself was contributing to it. From a technical point of view, he found they were now making in coal gas as good returns as the best London Gas Company, and accomplishing it with a very moderate consumption of fuel, and that their new machinery was paying a very handsome profit on the cost of it. A more unfounded, unfair, or misleading comparison could not possibly be made than that between the condition of things in Dublin and that of London.

Mr. R. H. DAVIS agreed with Mr. Jones. But he questioned if, after all, it was worth while taking so much notice of an anonymous critic. Did not business men agree in putting anonymous epistles into the waste-paper basket? He was glad to have the opportunity to bear testimony to the splendid work the Company were doing. Shareholders who wished to know these things should pay a visit to the works, and witness the energy, the discipline, and the up-to-date methods. As to the officers, the efforts of the staff to oblige their customers and the shareholders were beyond all praise.

The CHAIRMAN said he should like the shareholders to understand that he was not without knowing the gentleman who had anonymously signed the letters to which he had made allusion.

The motion for the adoption of the report and statement of accounts was then agreed to.

On the motion of the CHAIRMAN, seconded by Mr. SCALLAN, a dividend of 5 per cent. per annum on the ordinary stock was declared.

The thanks of the Company were accorded to the Chairman, Directors, and staff; and the CHAIRMAN and SECRETARY having made due acknowledgment, the proceedings concluded.

In regard to the proceedings at the meeting reported above, our correspondent, "Nonulus," writes to say he will ask for a reply to be

inserted in next week's "JOURNAL," as he has not had time to prepare a suitable one for this issue. He continues:

"While I cannot complain of the Chairman's reference to my criticisms, I am unable to agree with some of his arguments. My contributions, although over a *nom-de-plume*, have been entirely free from animus or personality. The object has been quite one of fair criticism of the Company's affairs—not arrived at haphazard, but built-up on actual facts.

"Sweeping aside all minor points, there stand out, significant and isolated, amongst important British gas undertakings, the extremely high capital ratio, the low market value of the stock, the failure to pay the standard dividend, and lastly, but not least, the very high selling price of gas.

"The Directors cannot expect (and, so far as I am concerned, I shall not be content for) the shareholders to either submit to such glaring anomalies, and stand by while their property is depreciated by nearly thirty points below par, or to look on while additional capital is issued—thus adding to the trouble.

"The remarks of Mr. H. E. Jones are scarcely consistent with the policy he pursues in other directions. If my comparison with London (and Suburban) Companies has been ridiculous, then my knowledge of my profession—in which I have spent nearly thirty years—must be likewise. But I am not going to permit Mr. Jones to escape. In a careful and calm manner I will attempt to show him that my comparison, so described by him as unfounded, unfair, and misleading, has been legitimate, accurate, and sound.

"With respect to Mr. R. H. Davis being in agreement with Mr. Jones, and his remarks otherwise pertaining to the destination of anonymous epistles, the latter is always a prerogative exercised by the Editor, who certainly would treat communications so, whether anonymous or otherwise, if unworthy of insertion in a great technical 'JOURNAL.' Moreover, for many years I have written over the *nom-de-plume* 'Nonulus,' not because I am ashamed or afraid, but because it suits me to avoid unnecessary publicity and curiosity.

"The concluding remarks of the Chairman, I take it, do not refer to me."

CHESTER GAS COMPANY AND PROFIT-SHARING.

An Increased Bonus.—The Company's History.

The annual meeting of the profit-sharing employees of the Chester United Gas Company was held on the 26th ult.—Mr. J. M. FROST, the Chairman of the Company, presiding.

The report presented by the Committee opened with an allusion to the death of the former Chairman (Mr. J. G. Frost), who, it was stated, was one of the most enthusiastic supporters of the introduction of profit-sharing among the employees, and followed with the warmest interest and pride its development and success. Accompanying the report were the accounts for the year ended the 30th of June. The bonus had been increased from 5 to 6½ per cent., so that the total earned for the year was £411 7s. 1d., compared with £329 9s. 7d. before; while the balances due to the employees at the end of the year amounted to £965 8s. 4d. The quantity of stock of the Company purchased during the year was £180; making an aggregate of £1310 purchased since the inauguration of the scheme. The Committee impressed upon all employees—more particularly those who had recently been, or might shortly be, admitted to benefit under the scheme—the absolute necessity of each individual recognizing the importance of his own personal interest in his employment, as only by the intelligent co-operation of all could the greatest degree of success be attained.

The CHAIRMAN, in moving the adoption of the report, said it was with considerable pleasure that he met the Profit-Sharing Committee for the first time a fortnight previously; and he repeated what he then said. He told them that, though he had always been interested in, and sympathetic with, the profit-sharing arrangement—leading, as he saw it had already done in a large measure, to co-partnership—he should look forward with still greater interest to a more intimate acquaintance with all the details of the work done by the Company's employees, and the effect this participation in its prosperity had upon them. Having referred to the centenary of the Gaslight and Coke Company, and given an epitome of the contents of the interesting pamphlet issued in connection therewith, the Chairman briefly sketched the history of the Chester Company. He said that as far back as 1817, a Company was formed and secured a licence from the Town Council to manufacture and supply gas. This was commenced in 1818, and had been continued ever since. Opposition works were started at the Roodee in 1851, and there was the keenest of rivalry between the two undertakings until 1856, when the older concern was bought up by the new Company. The amalgamated Company secured their first Act of Parliament in 1858, under its present title of the Chester United Gas Company. Having passed through times of scare, they were to-day interested in one of the most stable industries in the country. Many of the most intelligent men were devoting their whole time and energy in its interests; and, in spite of all competing industries, the demand for gas increased year by year. In their own case, this had been marked. Though the electricity department of the Corporation had taken all the public lamps and the municipal buildings, and had secured a lot of custom in the city, the Company had gradually increased their sales of gas until they were now 30 per cent. more than in the year the electric current was first supplied in Chester. This had been materially assisted by the good working and hearty co-operation of the officials and employees; and he earnestly hoped that no one would have the idea that his individual efforts and interest were of no avail. As intimated in the report, it was only by the joint efforts of all that complete success could be attained. It was with very much pleasure that he was able to announce a further increase in the rate of bonus for next year. The Directors had just reduced the price of gas to 2s. 6d. per 1000 cubic feet; and the next bonus would therefore be at the rate of 7½ per cent. This showed clearly how the employees' interests and those of the gas consumers were bound together.

Mr. S. B. HINDLEY, in seconding the motion, referred to the success which had already attended the profit-sharing scheme, and pointed out how absolutely necessary it was, in order to ensure still greater and continued success, that every employee should exercise his best energies, and constantly guard against both loss of time and waste of material.

Votes of thanks to the officials for their voluntary work in connection with the scheme and to the Chairman for presiding closed the proceedings.

CONTROL OF PUBLIC LIGHTING IN MANCHESTER.

Appointment of a Special Committee by the City Council.

A resolution dealing with the question of public lighting came before the Manchester City Council at last Wednesday's meeting, and led to a short discussion. In November last year, the Gas Committee were authorized "to determine the method of lighting to be employed in the public lighting of roads, streets, courts, and passages." Alderman Walker now moved that these words be deleted from the minutes of proceedings, and that the power given to the Gas Committee should be transferred to a Special Committee, to be known as the Lighting Committee, consisting of five members of the Gas Committee, an equal representation from the Electricity Committee, and five other members of the Council not being members of either of these Committees. There was really no opposition to the proposal; and the only point was as to the composition of the Special Committee and how the members were to be selected. Mr. W. Kay, the Chairman of the Gas Committee, took the wind out of Alderman Walker's sails, as he himself put it, by immediately suggesting that such a Committee should be formed, and to consist of the existing five members of the two Committees—Gas and Electricity—now considering the matter, together with five members of the Finance Committee; this being, he said, a financial matter pure and simple. The Gas Committee were prepared to light the streets at a price the Electricity Committee could not look at; but, of course, the Council would have something to say about it at the end of the year if they did. It would be for the Special Committee to determine if the prices quoted by the respective Committees were proper ones.

Alderman Boyle, M.P., in moving an amendment—that the Nomination Committee of the Council should select the members of the Lighting Committee—argued that by this means they would have an independent body, which could make the best bargain with one Committee or the other, having regard to the money they had to spend and the well-being of the community as a whole. On the other hand, Mr. J. Johnson said it was the desire of most members of the Council to do away with competition between the two Committees. Alderman Boyle's amendment would tend to increase the present rivalry. There was an impression that, owing to the jealousies existing between the two Committees, they had not been able to enjoy the full benefit of the magnificent sources of supply the City possessed in the two undertakings. Mr. W. T. Dagnall, who is Deputy-Chairman of the Electricity Committee, desired to put the Council right on this point. He said that while there had been some business rivalry between the two Committees in the development of their respective undertakings, there had not been, as some wanted to make out, any friction.

In the end, Alderman Boyle's amendment was defeated, and then Alderman Walker's motion was adopted by a very substantial majority.

GAS REGULATION IN NEW SOUTH WALES.

The Government of New South Wales have framed a General Bill for the regulation of gas companies; and the provisions were set forth in the number of the "JOURNAL" for the 17th ult. (p. 764).

The measure was read a first time in the Legislative Assembly on Aug. 8, after being introduced by Mr. Carmichael, who pointed out that it was a Bill to prescribe standards of illuminating power, purity, and pressure for gas; to regulate the price of gas; to regulate companies, corporations, firms, and persons supplying gas, and particularly with regard to dividends, reserve funds, accounts, and the issue of shares; and for purposes consequent thereon or incidental thereto. He said the Bill did not concern any particular gas company, but was intended to regulate all gas companies. It would be competent for the Australian Gaslight Company to pay a 10 per cent. dividend, provided they sold gas to the consumers at a reasonable price; and a sliding-scale was to be in force, so that the price must be reduced as the dividends increased, and the consumers would have an interest in the profits earned by the companies.

Mr. Wood urged the Minister not to hurry the Bill through, as it was very important that members should have ample time to consider the details.

Belfast Gas-Works Extensions.—The reconstruction of the Belfast Gas-Works is making headway. The new gasholder is almost completed; while the contractors for the new vertical retorts expect to have one portion finished and in working order before the end of the present month.

Suggested Electricity Supply for Bangor (Ireland).—In connection with a proposal by Mr. James Bowman, at the Bangor (County Down) Urban District Council, for the lighting of the main streets of that favourite North of Ireland watering-place by electricity, the Gas Manager (Mr. Barker Mitchell) reported that, as a rule, undertakings for the supply of electricity, for power and light, even in industrial towns of less than 30,000 population, are not paying concerns. This was so, he said, even when the schemes were run in conjunction with gas undertakings. A member of the Council remarked that an electric lighting scheme for Bangor would be worked at a loss. He felt that, no matter what happened, gas would remain with them. It was agreed that the Manager should report on the probable cost of a small plant for generating electricity.

FORWARD POLICY IN EDINBURGH.

A Meeting of the Edinburgh and Leith Corporations' Gas Commissioners was held on Monday of last week—Lord Provost Sir W. S. BROWN presiding.

It was reported that an inquiry had been received from a Leith firm of house factors as to terms for the sale of part of the Leith Gas-Works. A remit was made to a Sub-Committee to consider and report on the matter.

In this connection, Bailie PENNELL, seconded by Mr. STARK, gave notice of motion that, with a view to obtaining the discharge of any untaxed casualties upon the site of the old Leith Gas-Works, a remit be made to the Clerk to bring up a report to the Works Committee showing (1) areas affected; (2) casualties taxed and untaxed; and (3) restrictions. It was agreed to extend the motion so as to include the New Street works.

The monthly statement of the Engineer (Mr. A. Masterton) gave further evidence of the increased pressure on the resources of the undertaking that has come about as a result of the forward policy adopted by the Commissioners. The gas made during August totalled 112,184,000 cubic feet; being an increase of 7·23 per cent. The number of cookers fixed was 534, as compared with 168. Since May 16, 2506 cookers have been fixed, as compared with 254 last year. The total number of cookers on hire is 12,645 compared with 9211.

The Commissioners resolved to continue the present rates for gas, as recommended in a report and estimate prepared by the Engineer and the Treasurer (Mr. A. Canning Williams). The report was in the following terms:—

> We have assumed that, as a first result of the forward policy, a larger quantity of gas will be sold; and, to be on the safe side, we have taken this increase at the moderate rate of 2½ per cent., which, at current prices, will bring in additional revenue to the amount of £5533. The Engineer anticipates a considerable improvement (£10,675) in the return from residuals over that for last year, notwithstanding the fact that the income from this source in 1911-12 was 7·6 per cent. greater than it was in 1910-11. Against these estimated augmentations of revenue have to be set certain estimated decreases in income and increases in expenditure, the principal items being as follows:—
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> | | |
> |---|---|
> | Reduction in rental of stoves . . . . . | £2,154 |
> | Reduced charges to prepayment consumers . . | 1,213 |
> | Increase in cost of coal . . . . . | 14,098 |
> | Increase in cost of repairs of works and plant . . | 3,950 |
> | Increase in cost of distribution of gas . . . . | 3,077 |
> | Increase in cost of repairing and fitting cookers, &c. | 2,216 |
> | Health and Unemployment Insurance (new item). | 800 |
>
> It will be seen that the total anticipated revenue amounts to £347,168, and the total anticipated expenditure to £350,038, showing a deficit on the year's working of £2870. This, however, will be more than met by the unappropriated balance of profit which has accumulated during the past two years.

It was reported that the Assessors had fixed the valuation of the undertaking at £112,506, in terms of the decision of the Appeal Court last year.

A letter was read from Oxide Limited, asking whether the Commissioners would be inclined, on the expiry of their five years' contract, to purchase the works they proposed to erect at Falkirk. The Clerk was instructed to reply that the Commissioners would not on any account purchase the works.

In connection with a petition by employees in the meter-reading department for a revision of their wages, it was agreed to concede an advance of 1s. per week for the first four years of service, and thereafter 2s. per week per annum, until the maximum of 35s. per week should be obtained.

GAS FOR INDUSTRIAL PURPOSES IN BIRMINGHAM.

Last Wednesday's "Times" was accompanied by a supplement devoted to Birmingham and its industries; and in the portion dealing with the municipal work of the Corporation particulars were given of the gas undertaking, which is the largest in the British Isles—supplying an area comprising approximately 125 square miles, with a population of about a million persons. Having furnished statistics of the production and sale of gas and described the plant, the writer dealt with the various applications of gas; some of his remarks being as follows: "Possibly in no other town in the kingdom are the uses to which gas is applied so varied as in the Midland capital. Over 12 per cent. of the total consumption is for motive power purposes. The users of gas-engines in Birmingham are offered every assistance by the Gas Department. Expert advice is at their disposal; and, if it is so desired, their engines are indicated and checked free of charge. A large demand has also been established for gas for cooking purposes and the heating of rooms; and at the present time there are nearly 100,000 cooking-stoves in use throughout the area of supply. A large proportion of the gas is used in various manufacturing processes, such as japanning, lacquering, welding, and the melting of metals; and in this connection reference may be made to the distribution of high-pressure gas, which, besides illuminating the streets of the city and the shops and factories of the district, is in great demand for industrial heating purposes. Many firms in Birmingham have adopted high-pressure gas for melting metal. The Gas Department have built a foundry and installed furnaces therein on a full working scale, and made extensive experiments on the many methods of heating which are specially applicable in Birmingham. Local manufacturers who are interested in this method are afforded an opportunity of testing their own metal in this foundry, and can carry out their experiments in their own way with the furnaces installed, so that the conditions may resemble as closely as possible those existing in their own works. One of the largest metal-rolling firms in the city recently made such a test, during which 12,000 lbs. of metal (72 per cent. copper and 28 per cent. zinc) were dealt with. The total cost, taking into account pots, gas, furnace maintenance, labour, and losses in metal, showed a saving of at least 20 per cent. compared with coke-heated furnaces. High-pressure gas has been used in Birmingham for melting high-grade nickel alloys, up to 80 per cent. nickel, and is employed in a number of works for type metals, spelter, aluminium, all grades of brass, pure copper, silver, gold, German silver, and pure nickel."

PRICE OF GAS AT BOLTON.

No Reduction Possible at Present.

At last Wednesday's meeting of the Bolton Town Council, a very strong plea was put forward by Mr. France, one of the Labour members, in favour of a reduction in the price of gas. In moving a resolution to the effect that the time had arrived when the Gas and Lighting Committee should be directed to take this matter into consideration, Mr. France said he asked the Council to support him for two good reasons—one being consideration of health, and the other that of finance. By the cheapening of gas they would encourage its greater use for cooking, heating, and power purposes—thus reducing the smoke evil, and improving the health of the people by having a purer atmosphere. In this connection he observed that a little place like Atherton was supplying gas-cookers free, and in Glasgow 37,000 cookers had been lent free in the last four months; while at Rochdale where the ordinary price of gas was 1d. per 1000 cubic feet cheaper than at Bolton, a reduction of 6d. per 1000 cubic feet was made for gas used for cooking purposes. It had been argued that if they reduced the price and gave less to the rates from the gas undertaking's profits, rents would go up, with the result that the people would not benefit. In his opinion this did not follow at all, because it might be that by increasing the consumption they would be able to maintain the profits at the figure as at present, and so continue to relieve the rates. The Gas Department made a profit that was unfair, seeing that the cost of the production of gas was 1s. 4½d. per 1000 cubic feet; and he also thought it must be considered to be unjust that the users of prepayment meters should be charged so much more for their gas supply than the ordinary consumer, especially as the former were usually the poorest of the poor.

The Chairman of the Gas Committee (Alderman W. Webster) expressed the hope that the Council would not accept the motion, and for several very good reasons. They would have to spend a lot of money in bringing the Lum Street works up-to-date, and this could not be done if their profits were reduced. Then extra cost of coal was nearly £8000, which was a serious matter. If they reduced the price of gas 2d. per 1000 cubic feet, it would mean a loss to the Gas Department of £8348. This would make a difference of a little more than 2½d. in the pound in the rates; and on an £8 cottage it would represent 1s. 8½d. a year. The landlord would have to pay this; and to get it back he could not put less than 1d. on the weekly rent; so that the tenant would have to pay 4s. 4d. a year, and the difference would go into the landlord's pocket. After telling the Council that the Gas Department had now three special canvassers at work in an endeavour to encourage a larger use of gas for various purposes, Alderman Webster stated that when the time arrived that the Gas Committee could reduce the price of gas it would be done, and it might be in the near future.

On being put to the vote, the motion was lost by a large majority—only 16 voting for it.

THE CHALLENGE TO A COOKERY DEMONSTRATOR.

Its Non-Acceptance.

At length, Mr. F. S. Grogan has come face to face with Mr. R. G. Marks. This occurred in the Cambridge Hall at Southport, where Mr. Grogan was demonstrating with the "Tricity" cooker, and making the usual claims as to the cost of cooking being no more than that of using gas as the fuel. It will be remembered that, some months ago, Mr. Marks issued a challenge to Mr. Grogan to a competitive demonstration in public; Mr. Grogan using the "Tricity" cooker, and Mr. Marks a gas-stove. Mr. Grogan made excuses for not meeting his challenger; the principal one being a pressure of engagements. Apparently the pressure still continues, as he is still very loath indeed to meet Mr. Marks in the manner proposed. The latter gentleman saw Mr. Grogan's demonstration at Southport, and was very interested in the frying of a shaving of bacon, the baking of half-a-dozen puff pastries, and the heating of an iron. After such a wonderful performance, he was more assured than ever that a demonstration between Mr. Grogan and himself would show the former gentleman the error of his ways and of his contentions. Therefore, Mr. Marks on this occasion publicly challenged Mr. Grogan to a contest; but apparently this redoubtable champion of cooking by electricity is still unprepared to have a public demonstration to disprove his own assertions. All he (so we understand) simply said in reply to the challenge was that he did not consider it necessary to have such a demonstration, as there was no question whatever as to the electric methods being the best. This is the very reason why Mr. Grogan should be readily prepared to prove that, starting all cold, an electric-cooker will show greater economy in cost of fuel, greater economy in the output of the oven in a given time, and greater economy on the top plate (or extension plate) than a gas-cooker. But Mr. Grogan still holds aloof from an acceptance of this public challenge. Why this, when—if he has assurance that he can come out of it "top dog"—he could do electric cooking an immense amount of good?

An arrangement has been made for Mr. Marks to occupy a stand and give cookery demonstrations at the Exhibition at the Waverley Market, Edinburgh, from Oct. 23 to Nov. 3. This will afford an opportunity for all gas men in the North to go and inspect the methods that Mr. Marks advocates.

BRIDGWATER GAS COMPANY.

The Annual General Meeting of this Company was held on Friday, the 27th ult.—Mr. R. Y. FOLEY in the chair. The report of the Directors showed a balance of net profit of £3598, which was increased to £4903 by the amount brought forward and bankers' interest. After the payment of interim dividends, there was a balance of £3023 to be dealt with; and the Directors recommended the payment of final dividends, which made 10 per cent. on the "A" and 5 per cent. on the "B" and "C" stocks for the year—leaving £1398 to be carried forward. In moving the adoption of the report, the Chairman congratulated the proprietors on the continued prosperity of the Company as evidenced by the satisfactory balance-sheet and the large increase in the number of customers, which had led to a gratifying increase in the sales of gas. He referred to the anxious time which the management passed through during February, March, and April last, when for a period of eight weeks supplies of coal from the collieries were entirely stopped. The Company had, however, in anticipation of trouble, accumulated large stocks, which were the envy of many of the surrounding companies. There was never any fear of the supply of gas in Bridgwater being in any way curtailed, as was the case in so many towns, entailing great inconvenience and loss to the traders of these communities. The storing of large heaps of coal had, however, its drawbacks, and one of these was much in evidence one Sunday in March, when the Manager discovered several hundred tons had spontaneously fired. This entailed considerable loss at an inconvenient time. The monetary loss was, however, covered by insurance. The coal strike and increased cost in other directions, coupled with the extraordinary demand for coal owing to trade prosperity throughout the country, had made the colliery proprietors very stiff-necked, so that contract prices for coal this year were ruling 2s. 6d. per ton higher than last year. This meant 3d. or 4d. per 1000 cubic feet increase in the cost of gas. The Directors, however, hoped that normal prices would prevail next season; and, therefore, they did not propose increasing the price of gas at present as had been done by some of the neighbouring towns. The motion was carried unanimously. In moving the re-appointment of Mr. J. Hughes Cornish as Secretary and Manager of the Company, the Chairman made mention of the anxious and busy year which the staff had successfully passed through. Alterations and extensions continued to claim a great deal of superintendence on the part of the Manager, while the largely increased number of customers made ever-increasing demands on the time of the staff. Mr. T. W. Manchip seconded the motion, and it was carried unanimously. Mr. Cornish, in returning thanks on behalf of himself and staff, said it would have been impossible to have successfully passed through the year had he not been backed up by a loyal staff and a strong, unanimous body of Directors. He had been given a free hand early in the year in the matter of coal purchases; and this undoubtedly saved the situation in March and April. He hoped the new works in progress would prove all he anticipated in yielding better results financially and otherwise. A cordial vote of thanks to the Chairman and Directors for their careful attention to the business of the Company during the past year brought the proceedings to a close.

THE CO-PARTNERSHIP OF COMMERCE, ART, AND SCIENCE.

By M.A.C.B.

[Reprinted from the October issue of the "Bulletin" of the British Commercial Gas Association.]

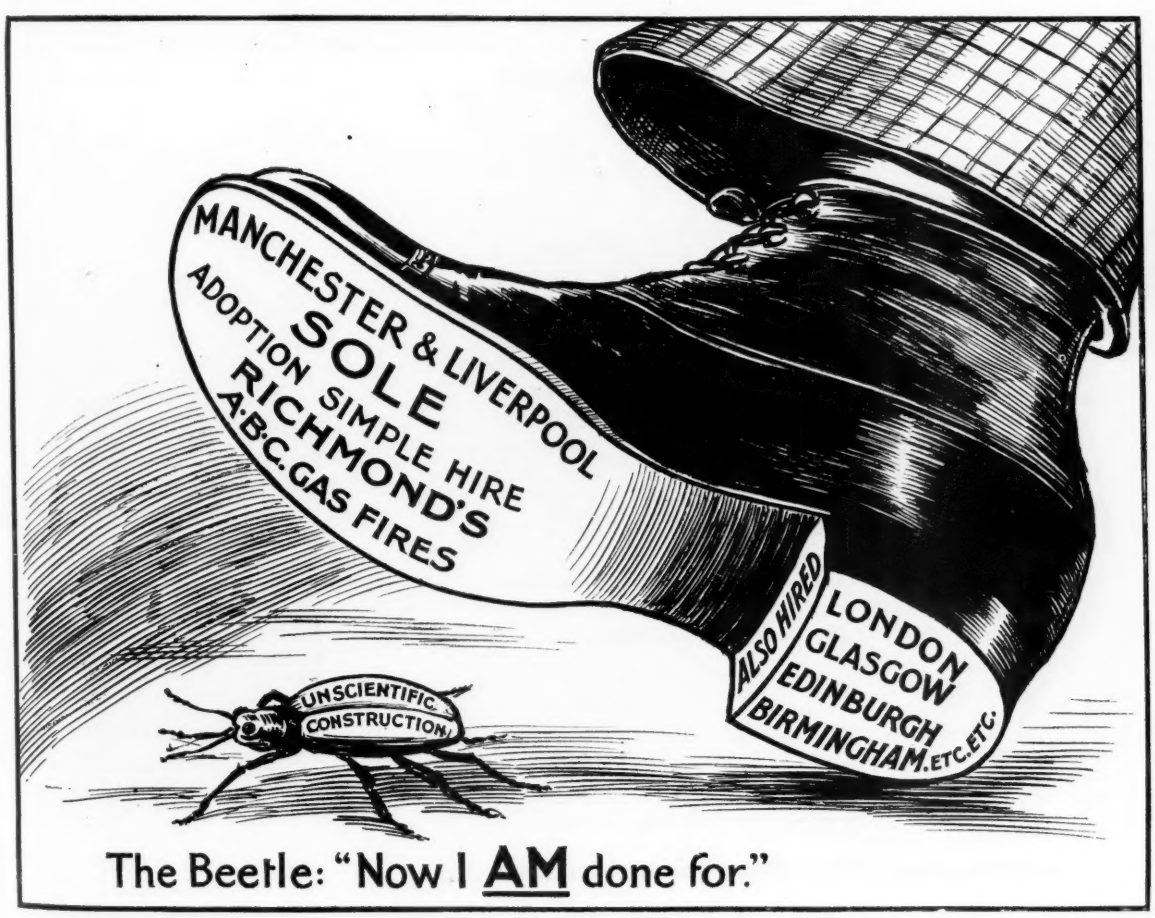
The true spirit of modern business has perhaps never been better expressed than by Lord Morley when he said that this is the "Century of the Application of Science to Industry." All men engaged in commerce and business would do well to ponder seriously what that broad statement really means. Fundamentally, it means the breaking-down of every barrier between the trades and professions. It means co-partnership of all the world's work. It means that the man of business is the link between theory and practice. It means, for instance, that the craftsman engineer brings in concrete form the dream of the mathematician to the door of the peasant's cottage, and even into his home and to his very fireside, in the form of pure water or pure fuel. It means that the inventor and the doctor, the professor and the pastor, the manufacturer and the salesman, are in the very best sense all bound inseparably into one great "Guild of Service" to the community.

The man, in fact, who brings the good news and places the finished and tangible result of all that science—and art, as well, mind you—has achieved, and is achieving, within the reach of mankind, is, to struggling men and women, a kind of Mercury or Messenger of the Gods. We, who are almost exclusively concerned with this bringing of goods to the public, should therefore be proud to do our share of the work, and to do it well.

If we could only look at the salesmanship side of Commerce in this broad-minded way, we should be proud—we are, most of us, very proud—to be called a "Nation of Shopkeepers." Like another christening, which originated in Antioch of old, as a nickname or term of reproach, we English have, like the early "Christians," adopted the once sarcastic appellation, a "Nation of Shopkeepers," as a true description of us, the greatest commercial nation the world has ever seen.

And why is modern business so worthy a vocation? Why is there, in this twentieth century, no real demarcation between our sons in what used to be called the "learned professions" and those who are "in trade." It is because of this substitution of interdependence for independence. For does not modern business absorb and assimilate all professions and all arts and crafts?

Take our own Industry as an example. What profession, what branch of science or art, does not contribute to the perfecting of its



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manufacture and its distribution? Science, art, medicine, the law, even—perhaps we should say most of all—the church (for those who know most of our large business concerns, know that the business morals of the great British houses are concrete examples of a religion which goes much deeper than mere church-going, a religion which is not removable with the Sunday suit)—all these are freely laid under contribution. Our business battles are, like those other battles which have become proverbial, in reality fought on the playing fields of those schools where our national religion takes its root. The true captains of industry are, like the successful captains of our great schools, those who can make the other fellows play-up and "play the game," play for their side and not for themselves, for their school or profession and not for individual glory or merely for their "House," who can inspire them to be truthful, clean and straight, fearless and yet courteous, ambitious and yet considerate.

But in order to get the best out of each and every man, it is necessary that each worker, even the humblest and the youngest, should have an opportunity of knowing something about the history and the present scope of the whole trade of which he is a unit; so that he may grasp as far as possible something of the unity of the job which he and his fellows carry through. Then it will not signify much to these units whether they, as individuals, have to be satisfied to find their expression day after day in using a spirit-level in order that the foundation stones of the temple of industry may stand true and firm, or whether they are among the artificers and engravers of the last final touches of decoration to that same modern temple. Nor will they consider it anything but a pride that they are even the "doorkeepers," who open and show forth daily the services of that temple to those whose daily needs it satisfies. And why? Because there will grow up that best and most permanent of all co-partnerships—a co-partnership of souls.

The men, with a better grasp of the magnitude and intricacies of the particular industry which they serve, as a lover serves his mistress, and which, in proportion as they truly serve, they also command as does a loyal lover, will see the infinite "complexness" of that vocation of theirs, and see it whole.

They will, perhaps slowly, but nevertheless surely, imbibe a spirit which will be the death of the strike fiend, for they will cease to be merely "hands" and will, with their larger understanding and more developed imagination, realize a second half to the truth that the rest of labour and all capital would be crippled without themselves—namely, that they themselves could not exist without capital and the rest of labour. For in business, as in life generally, no man lives to himself or dies to himself.

Further, they would begin to understand that capital means not only money capital, but the capital of accumulated knowledge—and a very large proportion of that capital is knowledge and hard work invested by men long dead. We are, in fact, reaping the fruits of the compound interest of the labours of those who have gone before—men of science, men of business, hand-workers, brain-workers, practical men, and mere dreamers, men of all lands, of all ranks, of every craft. Nor must we forget in such a co-partnership the nameless women who made such accumulated wealth possible.

Finally, if we do so regard ourselves as living parts of one great co-partnership of labour, we should one and all be proud that by virtue of our salesmanship, rightly understood and rightly carried out, we are enabling commerce, which unites in itself all that the past ages of art and science have stored up for the good of mankind, to actually confer the results of that beneficent union on mankind. And, knowing that business, properly conceived and carried out, embraces all learning and all knowledge, we ought to think shop, talk shop, dream shop; so that not only in our hours of leisure but in our hours of work we may truly live. Only by learning to "dream our business," as one of the most successful captains of industry put it, can we be proud to be a nation of shopkeepers, and be proud of our own share in the shopkeeping, however humble that may seem to be, provided we do it to the uttermost of our ability, and with a wholesome spice of personal ambition.

CO-PARTNERSHIP AT WATFORD.

The third annual meeting of the co-partners of the Watford Gas and Coke Company was held at the Gas-Works on the 27th ult.—Mr. W. PEARKES, a Director of the Company, in the chair.

The CHAIRMAN, in placing the accounts before the meeting, informed the men that the fund had now been in existence for three years, and was still as prosperous as ever. During the past year members had contributed £381, and to this amount the Company had added £480 as bonus and interest. With its 105 members it was remarkable that in the short time of its existence no less a sum than £2586 had been placed to the credit of the employees. Stock had been issued amounting to £1535; and on this amount the co-partners were obtaining dividends at the rate of £5 17s. 6d. per cent. per annum. To-day there were 35 gas undertakings, with a total capital of £50,000,000, who had adopted the co-partnership principle; but, perhaps with the exception of two concerns, the Watford Company was the only one where a contributory scheme obtained. Mr. Pearkes emphasized the fact that co-partnership placed the men in a position of independence and confidence, inasmuch as it provided not only for illness and unusual expenses now, but enabled them to put by sufficient to meet old age with cheerfulness. The amount of the withdrawals this year was rather heavy. While he was fully aware that no one could help illness, he besought the members to do all in their power to refrain from withdrawing money from the fund; so that the amount might accumulate for use later in life. He asked them to keep the principle of co-partnership ever before them—no waste, no shoddy work, each man doing his best to help his fellow and thus adding to his own happiness and prosperity, and to the welfare of the firm for which he laboured. The balance-sheet and report were adopted.

A vote of thanks to the Chairman for presiding brought the meeting to a close.

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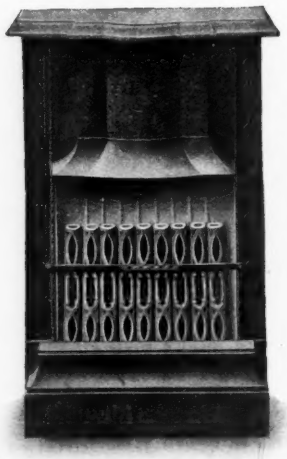

The "NEWBATTLE."

LEYDEN MUNICIPAL GAS UNDERTAKING.

Report for the Year 1911.

We have received from Heer N. W. van Doesburgh, the Manager of the Municipal Gas and Electricity Works of Leyden, a copy of the detailed report of the operations of these works for the year 1911. The following particulars relative to the gas undertaking have been abstracted from the report.

A change in the mode of appointment of members of the Corporation Gas and Electricity Committee has been made, with the result that the existing three members, one of whom would otherwise have retired, have all retained their membership. Some small parcels of land have been taken into the works in the course of the year, and sums have been voted for the extension of gas supply to the outlying districts of Hazerswoude, Koudekerk, and Oegstgeest. The salaries of workmen receiving less than £62 10s. per annum have been increased. Contracts for the supply of coal to the gas-works at Leyden and The Hague had been made for twelve months ending March 31, 1912, for 18,000 tons of Westphalian, 3500 tons of English coal, and for the ensuing twelve months for a supply of 24,000 tons of Westphalian coal. The tender of Messrs. Burt, Boulton, and Haywood, Limited, of Paris, for the purchase of the coal tar produced has been accepted. The accounts of the gas undertaking for the year show a gross profit of 141,662·98 florins (£11,805 5s.), and, after paying interest and redemption charges, a net profit of 53,815 71 florins (£4484 13s.) The net profit is about £884 higher than in the preceding year.

The carbonizing plant consists of nineteen beds each of eight retorts. Some of the beds have been renewed in the course of the year; and the vessels of the water-gas plant have been partially relined. Meters, mains, small gasholders, and apparatus in connection with the supply of gas to the outlying districts already mentioned have been purchased in the course of the year. The total length of mains is now 50·3 miles. The average pressure in the centre of the district varied from 13-10ths to 16-10ths of an inch.

The coal carbonized in the course of the year amounted to 26,619 metric tons. The average make of gas was 11,016 cubic feet per English ton of coal, which is an increase of 183 cubic feet per ton on the make for the previous year. There were produced in the year 286,630,448 cubic feet of coal gas, and 7,360,568 cubic feet of carburetted water gas. There were used in the manufacture of carburetted water gas 702·13 metric tons of gas oil and 1629·445 metric tons of coke. The consumption of oil per 1000 cubic feet of gas made works out at 21·02 lbs., and of coke at 48·78 lbs., including the coke used under the boiler. The proportion of water gas in the mixed gas was 20·43 per cent. The increase in the total production of gas compared with 1910 was 3·45 per cent., and the increase in the amount of gas sold was 3·78 per cent.

The number of ordinary meters in use increased from 6577 to 6905, and of coin-freed meters from 4606 to 5327 in the course of the year. The consumption through ordinary meters increased by 0·22 per cent., and through prepayment meters by 15·01 per cent. The outlying suburbs took 12·56 per cent. of the gas disposed of. The unaccounted-for gas amounted to 4·35 per cent. of the total production. The gross calorific power of the gas distributed averaged 591 B.Th.U. per cubic foot at 60° Fahr. and 30 in. The specific gravity of the gas ranged from ·395 to ·559, averaging ·463. The number of public lamps fitted with incandescent gas-burners has increased from 1341 to 1348, and the number of burners in these lamps is now 1426. The mantle renewals have averaged 8·72 per burner per annum.

BIRKENHEAD CORPORATION WATER SCHEME.

Tunnel under the Dee.

At the Meeting of the Birkenhead Town Council last Wednesday, the minutes presented by the Water Committee included a proposal to construct a tunnel under the River Dee, for the purpose of carrying the proposed aqueducts in connection with the water scheme; the Corporation in the course of the present year to pay the sum of £6500 to the Dee Conservancy Board.

Alderman DEAKIN, in moving the adoption of the minutes, said the resolution would alter the method designed, when the Water Bill was before Parliament, for getting the water-pipes under the Dee, and would involve the expenditure of £4000 in addition to the cost estimated in the first instance. In 1910, the Engineers were considering this question, and boreholes were made in the river bed. Under the original suggestion of laying pipes beneath the bed, the pipe would be difficult to protect from external corrosion, and the joints would have to be flexible; while should a burst occur great difficulty would be encountered in repairing the damage. Under the circumstances, the Engineers suggested the abandonment of this method, and recommended the Corporation to construct a tunnel to carry the aqueducts. The Sub-Committee gave the matter very careful consideration, and had an interview with Sir Alexander Binnie at Birkenhead; the conclusion being arrived at that it would be desirable that a short length of tunnel should be constructed. The proposed tunnel would be 450 feet in length, and for a distance of some 100 feet beneath the navigable channel it would be about 21 feet below Ordnance datum. It would be of 8 feet internal diameter, and would allow the future laying of an additional pipe-line, while the pipes would be capable of constant inspection for repair. The estimated cost of the tunnel would be approximately £10,500, which was about £4000 more than the parliamentary estimate by the other method. Under the Corporation's Water Act, it was provided that on the impounding of the water in the

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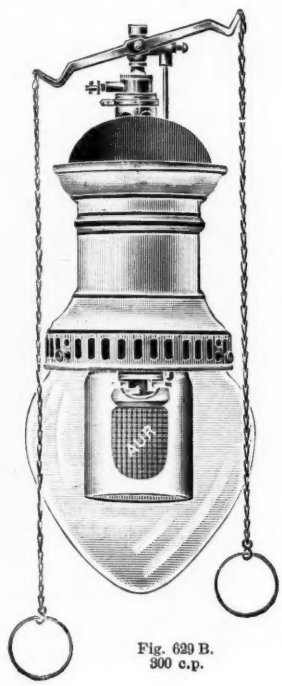

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Alwen reservoir the Corporation should pay to the Dee Conservancy Board the sum of £6500; and on the impounding of the water in the Brenig reservoir, or within a period of fifteen years after the commencement of the Alwen scheme, whichever might be the earlier, the further sum of £4000 should be paid. The plans of the proposed tunnel had been laid before the Conservancy Board; and the Engineers for the scheme, with the Town Clerk (Mr. J. Fearnley), had several interviews, and after lengthy negotiations the Board consented to grant the necessary easement, subject to the Corporation agreeing to pay in the course of the present year the sum of £6500. If this course were agreed to, the Corporation would obtain the necessary easement, and would save the cost of an arbitration which otherwise might be necessary.

Mr. A. M. ROBINSON seconded the motion.

Mr. T. L. DODDS said he did not suggest that the Council should interfere in matters of this description. Any deviation from the original plans must be left to the discretion of the Water Committee. He should like, however, to be assured that the matter had been considered, and that the expenditure was necessary. He was a little doubtful if a tunnel of the length given could be constructed at the expenditure of £10,000. They were practically at the beginning of a large outlay, and, with the knowledge of what had taken place in connection with other undertakings of a similar kind when expenditure had been increased through change of plans, he hoped great care would be taken in obviating any departure from the original scheme unless it was necessary.

Mr. A. M. ROBINSON said the Council might feel satisfied that the new departure had been most carefully considered by the Sub-Committee. It was no sudden determination of the Engineers. It was the result of months of consideration and the benefit of the very latest experience on the method of carrying pipes under water. The scheme was so fully and clearly placed before the Sub-Committee, that it was unanimously agreed that it was an economical and practical method.

Mr. A. W. WILLMER asked if the Committee were taking solely the advice of Sir Alexander Binnie, or if he had been in consultation with some other engineer. If not, he suggested that Sir Alexander should be consulted as to whether it would not be desirable to have his opinion sustained by another engineer, seeing that the late Dr. Deacon thought the method originally proposed was the best, and likely to effect the object they had in view. For what reason were they going to pay £6500 two or three years before it was necessary to do so? It was entailing upon the Corporation an expenditure of between £500 or £600. It seemed to him that the proposal was one that would benefit the Conservancy Board, and not one for which the Corporation should pay for the privilege, seeing that the pipes were going to be put down a considerable number of feet below the depth required by the Act.

The TOWN CLERK stated that during the parliamentary proceedings very eminent engineers were called in opposition to the Corporation's scheme, and every one of them said that the proper way to carry the aqueduct was to construct a tunnel, and not to put down a system of hydraulic jets. On the other point raised, a notice to treat had been served upon the Conservancy Board. The Board might say to the Corporation that they would decline to give the necessary easement upon any terms except such as might be settled by arbitration. This would be a very expensive matter; and the Water Committee were satisfied that by forestalling these payments, which they were bound to make, by two or three years, they would probably come off very much more cheaply in the end.

The motion was carried unanimously.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—On Wednesday, the Edinburgh and Leith Corporations' Gas Commissioners resolved to charge the following rates for gas for the ensuing year—viz.: (1) Consumers per ordinary meter within the municipal boundaries of Edinburgh and Leith, at the rate of 2s. 8d. per 1000 cubic feet. (2) Ordinary meter consumers outside the boundaries, 3s. 2d.; and for gas supplied in bulk outside the boundaries, 2s. 8d. (3) For gas consumed per separate rented meter in gas-engines for power purposes and for special trading purposes, 2s. 3d. within the boundaries and 2s. 9d. beyond—an extra 3d. per 1000 cubic feet to be charged for gas used in engines beyond the boundaries for power purposes where no meter-rents are paid.

Buckie.—Under the auspices of the Buckie Gaslight Company, Limited, an exhibition of gas cooking, heating, and lighting appliances was opened by Ex-Provost Webster in the Fisherman's Hall on Wednesday. The exhibition lasted three days; cookery demonstrations being given in the afternoons and evenings by Miss Carter.

Dundee.—A man named William Land committed suicide on Friday by means of gas. He was found sitting in an arm-chair with his head, enveloped in a towel, resting on a gas-cooker; the gas being turned full on.

Falkirk.—At a special meeting of the Falkirk Town Council on Tuesday, it was agreed, by a large majority, that the price of gas supplied by prepayment meters should be reduced from 3s. 3d. to 3s. 2d. per 1000 cubic feet.

Inverkeithing.—The Inverkeithing Gaslight Company have now completed the extension at the works of the gasholder, which provides storage for 50,000 cubic feet of gas. The lighting area of the district has been greatly extended by the laying of new mains, which carry the gas to various outlying districts; this work being carried out by the Company's own workmen, under the supervision of Mr. Rutherford, the Gas Manager. Thirty additional public lamps have been erected, five of which are within the burgh boundaries and 25 in the county. These lamps were lighted for the first time on Tuesday evening by the new automatic method.

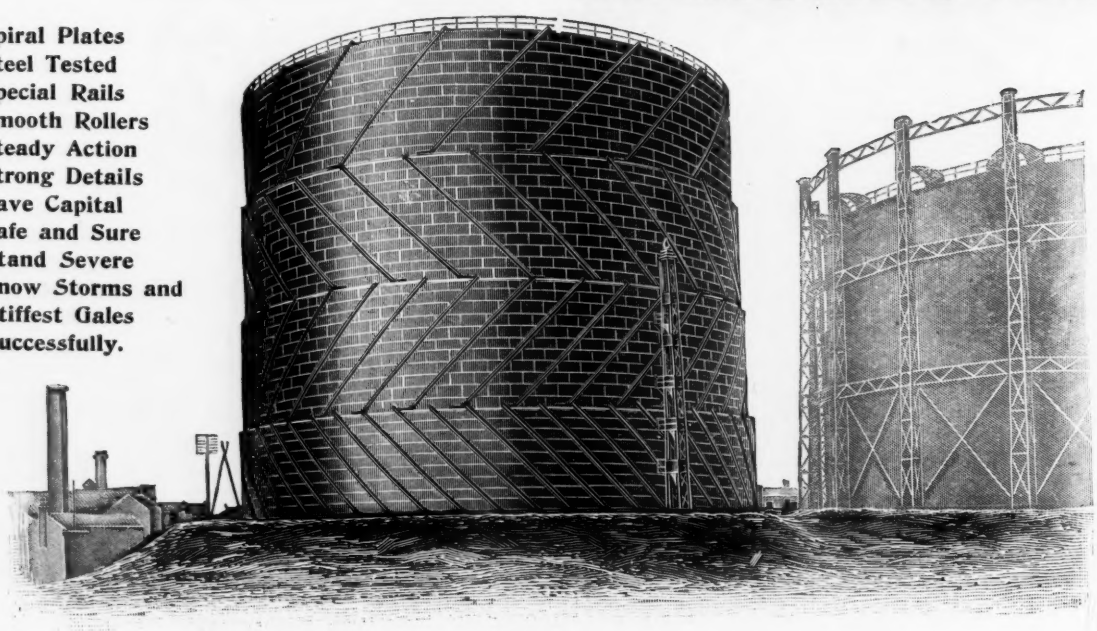
Motherwell.—At the monthly meeting of the Town Council last

R. & J. DEMPSTER, LIMITED,

Leading Makers of SPIRAL GUIDED GASHOLDERS.

MANCHESTER.

Spiral Plates
Steel Tested
Special Rails
Smooth Rollers
Steady Action
Strong Details
Save Capital
Safe and Sure
Stand Severe
Snow Storms and
Stiffest Gales
Successfully.



From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

Monday, it was unanimously agreed to adopt the Burgh Gas Supply Act, and take the necessary steps to acquire the gas-works.

Perth.—The inauguration ceremony in connection with the installation of the new stoking plant at the Corporation Gas-Works took place on Friday, in the presence of a full representation of the Town Council and officials. [A report of the proceedings will be found in another part of the "JOURNAL."]

Rothesay.—The annual finance meeting of the Town Council was held on Monday—Provost Fisher presiding. Treasurer Hicks submitted the gas account, which showed a total expenditure of £10,835. The sale of gas amounted to £9832, as compared with £9329 last year. The proceeds from residuals was £2638, as compared with £3296. Bailie James M'Millan remarked that the account was very satisfactory, although they had not such a large surplus as they anticipated. They estimated a surplus of £332, and it had turned out only £239. This was accounted for chiefly by the storm last November, which cost about £100 to repair the damage done. Councillor Buchanan called attention to the big decrease in residual products—tar being down £400 and sulphate of ammonia about £100. Bailie M'Millan said the reason for the drop in tar was that sometimes the barrels were supplied by the contractor, and at other times he contracted for it without the barrels. Then they had sulphate of ammonia on hand to the value of £136. The minutes of the Gas Committee were adopted.

Stonehaven.—At a meeting of the Stonehaven Gas Company, it was resolved to register the concern under the Companies Act. The capital of the Company is to be £10,000, in £1 shares; and four of these shares are to be reckoned as the equivalent of one of the present shares.

Tayport.—Messrs. Scott and Fyfe have recently had their premises fitted up with the Keith high-pressure gas lighting system. On the invitation of the firm, a large number of ladies and gentlemen visited the works on Friday night to see the system tested by Mr. Keillor, the Manager of the Broughty Ferry Gas-Works. The result was a great success.

The Lighting of Kingskerswell.—The Parish Council of Kingskerswell having decided to re-open negotiations with the Torquay Corporation, with a view to procuring a supply of gas from the St. Mary Church Gas-Works, the matter was referred to Mr. F. Chalmers (the Manager of the gas-works) for his opinion. At the meeting of the Torquay Town Council last Tuesday, Mr. Chalmers reported that since his former estimate was made changes had occurred which would increase the cost of the extension of the mains and the supply of gas to Kingskerswell by £400—making the cost at present £3200. This would, of course, necessitate a reconsideration of the terms offered. It was decided that, having regard to the rise in the price of material and the increase in the capital expenditure on the work, the Parish Council be informed that the Committee could not reconsider the question on the terms previously quoted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 5.

Sulphate of Ammonia.

During the past week, there has been more interest shown in this commodity by foreign consumers, but buyers in the home trade have continued to adopt a waiting policy. The supply has, however, been fully equal to the demand, and no recovery in values has taken place, though the decline has been arrested meanwhile. The prices at the close remain £14 5s. per ton f.o.b. Hull; £14 6s. 3d. per ton f.o.b. Liverpool, and £14 8s. 9d. per ton f.o.b. Leith. In the forward position producers for the most part still refuse to make any concession on the figures they were obtaining a few weeks ago; but it is reported that dealers are taking orders for this year at prompt values and over the first half of 1913 at a premium of only 2s. 6d. per ton.

Nitrate of Soda.

There has been no change in either the tone of the market or in the value of this material, and holders on spot remain very firm at 11s. 6d. per cwt. for ordinary and 11s. 7½d. for refined quality.

LONDON, *Oct.* 7.

Tar Products.

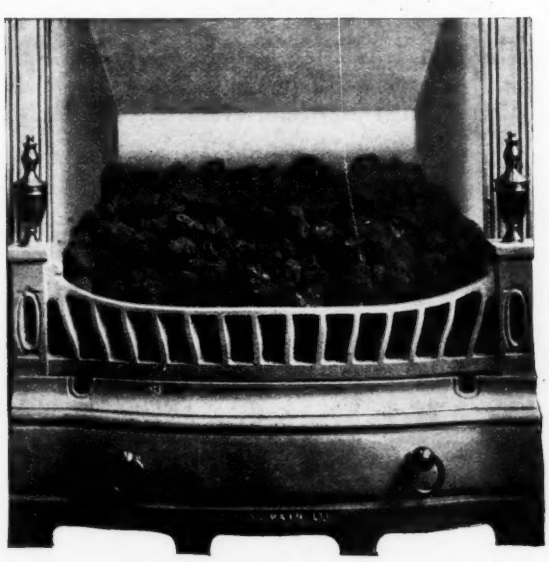
There have been one or two alterations in the market for tar products during the past week. Pitch is somewhat weaker; and it is reported that 46s. to 46s. 6d. has been accepted for east coast delivery. Benzols remain fairly steady for this year's delivery; but for next year quantities have been sold at slightly lower prices. Business in solvent naphtha does not appear to be quite so brisk. Heavy naphthas are in good demand, and maintain their price. Crude carbolic is decidedly weaker, and there is very little business doing. Creosote is in good request, and further sales are reported during the past week at the equivalent of to-day's quotations.

The average values during the week were: Tar, 28s. 9d. to 32s. 9d. Pitch, London, 47s. to 47s. 6d.; east coast, 47s. to 47s. 6d.; west coast, Clyde, 48s. to 49s.; Manchester, 46s. 6d. to 47s.; Liverpool, 46s. 6d. to 47s. Benzol, 90 per cent., naked, London, 1s. 1d.; North, 11⅓d. to 1s.; 50-90 per cent., naked, London, 1s.; North, 11d. Toluol, naked, London, 11½d. to 1s. 0½d.; North, 11½d. to 11¾d. Crude naphtha, in bulk, London, 5¾d. to 6d.; North, 5¼d. to 5¾d. Solvent naphtha, naked, London and North, 1s. 1½d. to 1s. 2d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 11d. f.o.b. Creosote, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 3½d. Carbolic acid, casks included, 60 per cent., east coast, 1s. 11d. to 2s.; west coast, 1s. 10½d. to 1s. 11d. Naphthalene, £5 to £9; salts, 45s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

Business has again been very dull in this article; and there has been considerably more stuff offering for prompt delivery. It would

SPLENDID! SPLENDID!



This was the enthusiastic comment of a Customer in our Show-room to-day (Monday, 30th September), who has had nine of our

"ST. NICHOLAS" GAS FIRES

fitted in his residences in London and Brighton.

R. & A. MAIN, LIMITED,

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

appear that those manufacturers who have been endeavouring to force buyers to purchase for September and October-June have been obliged to come into the market with their prompt stuff. The price for actual Beckton, we understand, is £14 2s. 6d.; but this make is being offered by dealers at under this. Outside London makes are £13 10s. to £13 12s. 6d.; Hull, £14 5s.; Liverpool, £14 6s. 3d. to £14 7s. 6d.; Leith, £14 7s. 6d. to £14 8s. 9d.; Middlesbrough, £14 5s.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a fuller demand for coal, and the prices have shown firmness; while the larger need for Durham coal for several industries has had its effect on gas coal. In the steam coal trade, best Northumbrians are from about 13s. to 13s. 4d. per ton f.o.b.; second-class steams are 11s. 6d. to 12s. 3d.; and steam smalls are about 9s. to 10s. 3d. The demand is fairly good; and the output is well taken up generally. In the gas coal trade, from the cause mentioned above the market is firmer. Best Durham gas coals are from 13s. 3d. to 13s. 6d. per ton f.o.b.; second-class gas coal is from 12s. 9d. to 13s.; and "Wear specials" are from 13s. 9d. to 14s. There is now some pressure in the demand for gas coals; and this may make the prices rather higher for occasional cargoes, as the heavy contracts leave only a limited amount of coal for sale. A contract for the Bergen Gas-Works is believed to be settled; but the results have not yet officially transpired, though they are believed to be on the basis of current values. Coke is very firm all round. Gas coke is steady at 21s. 6d. per ton f.o.b. The larger production of gas coke seems to be well taken up—the exports from the Tyne being heavy.

Scotch Coal Trade.

The tone of the coal trade throughout Scotland has been a shade quieter during the past week, due largely to a short supply of waggons, and a lack of tonnage. The demand is still good, however, and prices are unchanged. On Thursday, the quotations f.o.b. Glasgow were: Steam coal, 11s. 6d. to 12s. per ton; splint, 13s. 6d. to 14s.; ell, 11s. 9d. to 12s. 3d.; trebles, 13s. to 13s. 6d.; doubles, 12s. 6d. to 13s.; singles, 12s. to 12s. 6d.

Extension of the Looe Water Supply.—Additional works for the supply of water to Looe were inaugurated last Tuesday, when Miss Peter, daughter of the Chairman of the Urban District Council, turned on the water. The supply is derived from a source belonging to the Duchy of Cornwall, and the new works consist of a pumping-station and collecting reservoir. The additional supply will be about 20,000 gallons per day. Mr. R. A. Potter said the Duchy authorities had behaved in a most generous manner. They now had an ample supply, and had not borrowed a penny to carry out the new enterprise. Sir Arthur Hirtzell congratulated the town on the achievement of so important a piece of work.

An Interpretation Wanted.

Some of our manufacturers in the gas industry occasionally have some difficult interpretation work to perform in connection with their correspondence. The Davis Gas-Stove Company, Limited, for example, have just received a letter upon which they fail to place any satisfactory construction. The letter reads as follows: "Gentlemen,—Y herewith take pleasure to inquire whether you would be interested in purchasing one in Germany and in Austria-Hungary already patented and in England reported patent for Gasbathing-Automat. This Bathingstove-Automat differs from the known 'Gloria,' 'Askania-therme' as it has no feathers no clubs no membranes no leather-condensations and operates by lowpressure as well as by highpressure bathstoves excellently and the same can be applied to the one which is in use already. There are no repairs to be incurrwd. The German as well as the Austrian-Hungarian Patents are sold already to two large Mfrers Companies, which firms Y should be pleased to name upon your requestand which Concern will gladly give you information as to the usefullness of the same. Y am ready to send you one sample of this Automat or a skatch if you desire to have sent the same. Expecting to hear from you."

Large Stoves for Hereford Prepayment Consumers.

In the report which was adopted at the monthly meeting of the Hereford City Council, the Gas Committee stated that from the introduction of the prepayment system a small gas-cooker had been supplied free of charge when desired, but it had been found that this stove was not large enough, and a larger one of a more economical pattern had been specially designed for the work. The Committee have now fixed over 1000 for slot consumers in place of the old free stoves, and have charged a rent of 1s. per quarter in every case. The use of these stoves has resulted in a large increase in the consumption of gas; and in view of this fact, the Committee consider that the charge for the hire should be dropped, subject to certain conditions which will safeguard the Council against loss. They therefore recommend: (*a*) That from Sept. 30 no rent be charged to slot-meter consumers who at present hire 1¼-inch gas-cookers and continue to use gas to the amount of 3s. per month on the average during the year, and who have paid at least 4s. as rent for such cooker; and that as regards future applications for these stoves they be fixed on condition that a fixing charge be made of 4s.—2s. of this amount to be paid in advance, and the balance within six months; and that thereafter no charge be made, provided the consumer uses gas to the amount of 3s. per month on the average during the year. (*b*) That it be a condition that all consumers keep the stoves in proper order.

Morley Trading Departments.—The accounts of the borough of Morley for the year to March 31 show a balance of £740 in favour of the Gas Department, after making a contribution of £500 to the district fund. The water-works surplus was £313.

THIS BOOKLET

Contains full particulars of all that is best in Gas Fire Construction.

Fires with all the Latest Improvements giving the Highest Heating Efficiency.

It includes among others

THE "ELYSIAN"

with adjustable cornice, etc., and

The P.S.C. Series,

the Popular Priced Fires.

May we send you a supply for distribution?

IT WILL MEAN INCREASED BUSINESS.

THE PARKINSON STOVE CO., LTD.

BIRMINGHAM & LONDON.

Clacton Gas and Water Profits.

The report on the working of the Clacton Urban District Council gas and water undertakings for the year ended March 31 states that the net profit earned by the gas undertaking was £745, compared with £133 last year. The principal and interest paid during the year, with income-tax on profits, amounted to £4343. During the past eight years, while the undertaking has increased in size over 46 per cent., the outstanding capital liability, which now stands at £56,038, has been actually reduced by £5304, and the value of the undertaking has increased enormously. Now that the reserve has reached £3000, any surplus profits can in future be applied to the relief of the general district fund; and since the end of the year, a sum of £600 has been taken and applied to this purpose. A net profit of £423 has been earned on the water undertaking, as against £202 last year. The principal and interest paid during the year, including income-tax on profits, amounted to £3331, and the total amount of capital liability, now standing at £51,075, has been reduced by the sum of £1508. The opinion was expressed in the Council that the members and town would be well satisfied with the result of the working of the two undertakings.

Price Inequalities in Electric Supply.

In the issue of the "Ironmonger" for the 21st ult., reference was made to the differences in the price of gas in various towns; and the remarks were the subject of comment in the succeeding number of the "JOURNAL." Having dealt with gas, our contemporary turned to electricity, and showed, in the issue for the 28th ult., that similar differences exist in the charge for this illuminant. The writer said: "In some places the corporation supplies current at ½d. per B.T.U. for certain purposes; while in others 2d. and 2½d. are exacted. In one of our great cities, the charge for large users of current for power purposes is ¾d. per unit, while the electric light consumer is asked to pay 3½d., or nearly five times as much What would be thought about such a state of things if applied to other standard goods privately manufactured? What, for instance, would be said by the blacksmith if, now that the price for bar iron in lots of 1000 tons is £8 10s. per ton, he were made to pay £42 10s. for one ton? This is precisely analogous to the action of the electricity corporations in making such an enormous difference between lighting and heating supply. The practice stands in the way of all progress, because it deters thousands of people from having their dwellings lighted by electricity; and if the extension of lighting is thus interfered with, we may be sure that the extension of heating and cooking by electricity suffers still more. Many clever and effective electric warming and cooking appliances are being brought out; but what is the use of the ingenuity applied to them if the public supply of current is hampered by the narrow-mindedness of local authorities? Sooner or later something will have to be done to bring these magnates to a proper sense of the public claim upon them."

Gas Supply Development at Swinton.

The need for the extension and improvement of the gas-works, which were acquired some time ago, was the reason for a Local Government Board inquiry that was held at Swinton last Thursday, regarding an application by the Swinton and Mexborough Gas Board for sanction to borrow £22,200. The Clerk (Mr. J. W. Hattersley) pointed out that the money asked for would be spent as required; and it was estimated that about £4000 would be needed in the first two years. The prospects of the undertaking, he added, were very bright indeed; and since the Board took over the works, the first six months' running had produced a revenue of £3039, while the most the old Company had ever realized in a year was £2733. There was reason to believe that after the first few years the works would not only pay their way, but actually contribute something to the rates, or else place the Gas Board in a position to cheapen the price of gas. Mr. J. H. Brearley, of Longwood, and Consulting Engineer to the Swinton and Mexborough Gas Board, gave evidence in regard to the increased consumption of gas in the Board's district. The demand, he said, had grown ever since the Board took over the concern; and it was anticipated that the applications would continue—now that people had had afforded to them the opportunity of using gas in pennyworths – until practically every house was supplied. There was no opposition to the application.

Blackburn Water-Works Extensions.—Within the past few weeks, important contracts have been let by the Blackburn Corporation for the construction of a new reservoir at Wilpshire, to cost £52,000. It is expected by this Wilpshire scheme to postpone for many years extensions at the Whitewell water-works of the Corporation, estimated to involve an expenditure of not less than £100,000. It may be mentioned, in this connection, that the Corporation have just completed at Revidge a new reservoir costing £8000.

Maligning the Gas-Fire.—Under the heading "Told After Shop Hours," the following remarks appeared in a recent number of the "Ironmonger:" "The writer of a column of humorous comment in a daily paper has fallen foul of the gas-fire because, as he says, there are no fenders to such fires, no place to put your feet on, no hob and no top bar, nowhere to knock your pipe out, no scope for the coal-scoop, and no need for tongs or poker. As too often happens with the humorist in a hurry, this funny man has imperfectly studied his subject. All properly appointed rooms furnished with gas-fires are also supplied with fenders. Top bars and trivets can be added if desired; and even a cigar-ash tray can be attached if the smoker is too lazy to use the one on the mantelpiece. There is no need for a poker, it is true, when you instal a gas-stove; but a full complement of fire-brasses is often retained as ornaments, and not as weapons of offence. Some ultra-fastidious people pretend that a gas-fire produces stuffiness in a room; but when intelligently fitted to a flue free from down-draught, no trouble of this kind need be feared."

It is the Absolute Simplicity of our Steamless Radiator

That accounts for the vast popularity it has attained during its five years' existence in the gas world.

Nothing but praise is received from users all over the globe, and, as a consequence, its sales records are broken year after year.

We hold a big stock of Standard Lines and can

DESPATCH INSTANTLY.

THE DAVIS GAS STOVE CO. LTD.

Sales Dept. and London Show-Rooms: 59, Queen Victoria Street, E.C.

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Increased Price at Drighlington.—Owing to the great increase in the price of coal, the Drighlington and Gildersome Gas Company have found it necessary to advance the price of gas; and on and after the 1st inst. the users of gas supplied by this Company have to pay 3d. more per 1000 cubic feet.

Glasgow Water Supply.—The boring of the tunnel which is being constructed at Inversnaid to join Loch Arklet and Loch Katrine in connection with the Glasgow water supply has lately been completed. The tunnel is about 1100 yards in length; and its inside dimensions are 12 ft. by 10 ft. The work of piercing the hillside between the two lochs was started more than two years ago; but very hard rock was found, and for a time little headway was made. Now, however, the finishing work will proceed more rapidly. Basins are to be built at each end of the tunnel.

Welsbach Light Company, Limited.—The report of the Directors of this Company for the year ended March last sets forth that the Company was incorporated for the acquisition of the undertaking of the Welsbach Incandescent Gas-Light Company, which went into liquidation in March, 1911. As a result of the change in the control, some alterations in organization have been made necessarily involving an initial expenditure which, during the period covered by the accounts, was not recouped by profits earned. These alterations, however, have been effected with the object of paving the way for an expansion of business in the future. The profit and loss account for the period under review shows a loss of £4952. The dividend from the Austrian Company is less by some £10,000 than that received in respect of each of the three years immediately preceding the period covered by the accounts from the same source by the old Company. The Board of the Austrian Company felt it necessary, so as to equalize dividends in the future, not to distribute a larger dividend than 12 per cent.

Dear Coal and the Price of Gas at Rotherham.—In moving the adoption of the minutes of the Gas Committee of the Rotherham Corporation at the monthly meeting of the Borough Council last Wednesday, Alderman Gummer pointed out that it was proposed to purchase 19,500 tons of coal at an average price of 11s. 6d. per ton, compared with an average of 9s. per ton a year ago. This meant an increased outlay of £2388 on the total quantity. The Committee had hopes that during the year they would seriously consider the question of reducing the price of gas. But he now wished to state that, while desirous of redeeming the promise made, it was impossible to do anything towards this end. The increased cost of coal was very great, and if, in addition, they took £500 which would have to be paid as the extra cost of labour, owing to the advance granted to employees, £150 which had to be paid under the National Insurance Act, £200 the estimated advance in various sundries, together with an increase of £998 per annum demanded by the Assessment Committee, the total was actually more than the net profit of last year. Under the circumstances, he did not see how any gas consumer could expect to have a reduction in price while this state of things obtained.

Alleged Irregularities at Wallasey.—It was stated by Alderman E. Peace, at the meeting of the Wallasey Town Council, that he understood there had been some defalcations in connection with the Gas Committee's accounts. He asked what steps were being taken by the Committee to prevent similar occurrences in the future. Mr. W. Eastwood, the Chairman of the Gas and Water Committee, replied that the matter had been considered by the Finance Committee, and that a Sub-Committee had been appointed to inquire into the system of keeping the accounts.

Municipal Electric Lighting in Southwark.—According to the accounts of the electricity undertaking of the Southwark Borough Council for the past financial year, which were submitted at a meeting of the Council last Wednesday, the total income was £20,714, and the total expenditure £15,053; the gross profit being £5661, or £531 less than for the preceding year. This represented a return of $5\frac{3}{4}$ per cent. on the total capital outlay. From the gross profit, £2616 had to be deducted for interest on loans and repayment of capital. The Engineer (Mr. D. M. Kinghorn), in his report, stated that the effects of the series of strikes which had occurred in the year would be felt for some time to come.

Failure of the Electric Light in Dublin.—The electric light supply to Dublin failed on two occasions on the evening of Sunday, the 29th ult., with the result that streets, churches, dwelling-houses, and night-works, such as newspaper concerns, were in darkness for a considerable time. In churches where gas is in reserve, the lights were at once brought into use. In newspaper offices candles had to be resorted to in some instances; and business was carried on with a good deal of difficulty. The breakdown is officially stated to have been due to a transformer at the pumping-station getting out of order. The light first went out at 6.25 p.m., and was not switched on until 7.15 p.m. The second breakdown occurred shortly afterwards, and lasted about fifteen minutes.

Gas Enterprise in the Peak District.—There is, says the "Sheffield Daily Telegraph," a development with regard to the enthusiasm for gas extensions in the Peak of Derbyshire. The Matlock district alone has found something like £100,000 in recent years for gas flotations. Last Saturday week, the details were discussed for the taking of gas to the district of Dethick Lea and Holloway, 3 miles from Matlock and Matlock Bath. A canvass of the district has resulted in an enormous majority in favour of the scheme. A new feature has, however, now arisen. The Matlock Bath Council have offered to bring gas from the end of their service at Cromford Station to Lea, and charge 3s. 4d. per 1000 cubic feet. The Matlock Gas Company, on the other hand, are willing, under certain conditions, to supply gas at 2s. 6d. per 1000 cubic feet, or (if the residents prefer to form a little private company at Lea) to sell it in bulk. The Matlock Gas Company have mains at Tansley, about $1\frac{1}{2}$ miles from the boundary of Upper Lea; Matlock Bath are about the same distance, at Cromford; and yet a third Company—the Ambergate—come towards Holloway on the other side.

WRIGHT'S GAS-GRATES.

"KENILWORTH" Dog Grate.

BASKERVILLE" Dog Grate.

"SIRIUS" Dog Grate.

These handsome gas-grates are specially designed for placing in an open hearth. The "KENILWORTH" and "SIRIUS," being fitted with canopies and flues, can be placed with pleasing effect in front of a tiled surround. Send for full particulars.

JOHN WRIGHT & CO., Essex Works, BIRMINGHAM.

Reduction in Price at East Dereham.—The East Dereham Urban District Council have agreed to a recommendation of the Gas Committee that the price of gas should be reduced by 6d. per 1000 cubic feet, as from Jan. 1 next.

Collections from Prepayment Meters.—In the course of the investigation last Friday of a charge of stealing money from a prepayment meter, the Magistrates at the West Ham Police Court asked the Solicitor who prosecuted for the Gaslight and Coke Company (Mr. R. Humphreys) how often the collections were made, and he said it was every two months. The Chairman (Mr. H. J. Cook) said the Bench felt strongly that it was putting temptation in the way of poor people to leave the money so long; collections should be made at least once a month. The Bench would like their representations put before the Directors of the Company. Mr. Humphreys said he would see that this was done. The Chairman added that the Bench felt the Company's system was defective, in view of the many cases of meter robberies that came before them.

South Metropolitan Gas Company and National Insurance.—The current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company contains a report of a meeting of the Co-Partnership Committee held early last month at which it was stated that at various gatherings of the employees it had been decided that they should become an Approved Society under the National Insurance Act, and continue, under conditions altered to suit changed circumstances, the good the Sick and Burial Fund had done since 1842. It had also been decided that the Co-Partnership Committee should be asked to undertake the duties of Committee of Management of the Society. This they agreed to do. It was unanimously resolved that Mr. [now Dr.] Charles Carpenter be President and Mr. F. M'Leod Treasurer, and that Mr. H. Lesser be Secretary of the South Metropolitan Gas Company's Employees' Provident Society. The Trustees elected were Messrs. W. Cupit, J. Newbold, and J. Waterer, the Employee-Directors.

Thorne and District Water Company.—The recently formed Thorne (South Yorks.) and District Water Company have let a contract for the erection of a pumping-station at Hatfield, laying a delivery main between Hatfield and Thorne, and other things specified by the Engineers (Messrs. Parker and Sharp, of York). The work will be proceeded with shortly. It is intended later to erect also a pumping-station at Thorne. From the result obtained by the borehole, the Engineers are satisfied that an ample supply of water is available from the sandstone of the locality, of a satisfactory quality, and suitable for domestic use. The well is at Hatfield, in close proximity to the Doncaster Road.

Messrs. Edward Cockey and Sons, Limited, of Frome, have recently been successful in securing contracts from the Blaenavon Gas Company, for a single-lift gasholder in steel tank; and from the Bridgwater Gas Company, for a coal-store roof, and also a foul main in connection with the installation of vertical retorts.

In order to conserve the supply of natural gas in Kansas, all industrial manufacturing works which have hitherto used it were required to discontinue the practice, and to change either to coal or oil, on the 20th ult. It is intended to husband the gas for domestic use, and the Company who control its supply have not only taken the step mentioned, but have simultaneously increased the price from 1s. 3d. to 2s. 1d. per 1000 cubic feet.

Several English firms tendered for the erection of gas plant and a gasholder and steel tank at the works of the Edmonton, Alberta (Canada) Municipality. Messrs. Robert Dempster and Sons, Drakes Limited, Hanna, Donald, and Wilson, and W. C. Holmes and Co. sent in prices that nearly approximated each other. The successful firm, however, was Messrs. John Coates and Co., of Suffolk House, Laurence Pountney Hill, E.C., whose figures were $106,040 for the gas plant, and $33,315 for the holder and tank.

GAS COMPANIES' STOCK AND SHARE LIST.

On the Stock Exchange, as elsewhere, the momentous question of the week was, Peace or War? Hopes and fears alternated. Depression prevailed during the first half of the week, and then gave way to a fond clutching at the chance of the Great Powers being able to preserve peace, though at present the prospect of their doing anything effectual does not look roseate. But for this incubus, markets generally were in such a healthy state that they might fairly have had a very bright time. The opening was flat and despondent, and apprehension and uncertainty kept business down to low pressure. Government issues were pretty steady; but Railways were lower. Americans were strong, though some lines were not at their best at the close. The Foreign Market was, naturally, dull. Accentuated flatness was apparent on Tuesday; the outlook being regarded ominously. Government issues gave way, but not to an alarming degree, and Consols were ⅛ lower. Rails again marked lower prices on sales; and even Americans were not quite so good. Wednesday opened without a ray of light and remained dull a long time; but before the close there were symptoms of relief. Gilt-edged things bore up pretty well; but Rails were lower throughout, and the Foreign Market was very flat. Thursday profited by the calmer tone at the close of Wednesday and made better prices everywhere. Consols recovered their loss; and all the leading departments showed improvement. Friday was a good day on the whole, starting fair and going well nearly up to the close; and markets for the most part were firmer. On Saturday, business was very quiet, and caution seemed the order of the day, the protracted tension of the political situation being extreme. In most markets, there was but little movement; but Americans still gained ground. Consols closed unchanged at 73⅜ to 74⅛. In the Money Market, there was a good demand, the supply to meet which was ample. Discount was fairly firm at first; but rates eased down before the close. Business in the Gas Market was a fair average, though many issues were wholly neglected. The general tone was good, and a number of issues made advances in value, some being considerable. In Gaslight and Coke, the ordinary was pretty active and closed unchanged; all transactions being marked between 105 and 106½. The secured issues were quiet. The maximum realized from 81⅜ to 83, the preference 99 and 99½ (a rise of 1), and the debenture 77 and 78. South Metropolitan was very quiet at 116½ to 117½; and the debenture marked 77⅛. Nothing in Commercials was done, except the debenture at 74⅜. Among the Suburban and Provincial group, the only dealings in London were in South Suburban at 120 and 120¼. On the local Exchanges, Newcastle realized 98¾, Tynemouth 114½ (a rise of 1½), Liverpool "A" 216 (a rise of 3), ditto "B" 156 (a rise of 1), and South Shields advanced 7. In the Continental companies, Imperial changed hands at 181½ to 184, Union at 84, ditto preference at 133¾ to 134¾, and European at 19½ and 19¾. Among the undertakings of the remoter world, Bombay made from 6¹¹⁄₁₆ to 6¹³⁄₁₆, Monte Video 11 and 11¼, Ottoman 8⅛ and 8⅜, Primitiva from 7⅛ to 6¹⁵⁄₁₆, ditto preference from 5⁷⁄₁₆ to 5¼, and San Paulo preference 11⅞.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	78—83	..	6 0 6
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
250,000	5	Apl. 12	7½	Bombay, Ltd.	6½—7	+¼	5 7 2
50,000	10	Aug. 29	15	Bourne- 10 p.c.	28—29	..	5 3 5
332,000	10	"	7	mouth Gas B 7 p.c.	14—14½	..	4 2 9
75,000	10	"	6	and Water Pref. 6 p.c.	14—14½	..	4 2 9
380,000	Stk.	Aug. 14	13½	Brentford Consolidated	255—260	..	5 3 10
330,000	"	"	10½	Do. New	195—200	..	5 5 0
50,000	"	"	5	Do. 5 p.c. Pref.	116—118	..	4 4 9
206,250	"	June 14	4	Do. 4 p.c. Deb.	96—98	+1	4 1 8
218,230	Stk.	Aug. 29	11	Brighton & Hove Orig.	210—215	..	5 2 4
244,200	"	"	8	Do. A Ord. Stk.	152—155	..	5 3 3
530,000	20	Sept. 27	12½	British	44—45*	..	5 11 1
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91—93	..	4 6 0
250,000	Stk.	June 28	4	Buenos Ayres 4 p.c. Deb.	93—95	..	4 4 3
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	3¼—4¾	..	—
100,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	70—73	..	6 3 3
157,150	Stk.	Aug. 29	5	Chester 5 p.c. Ord.	107½—109½	..	4 11 4
1,513,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Stk.	106—108	..	5 1 2
560,000	"	"	5½	Do. 3½ p.c. do.	101—103	..	5 3 6
475,000	"	June 14	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	83—86	..	4 13 0
200,000	"	"	7	Do. 7 p.c. Pref.	133—135	..	5 3 8
492,270	Stk.	—	5½	Derby Con. Stk.	124—125	..	4 12 0
55,000	"	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,140	10	July 26	10	European, Ltd.	19—20	..	5 0 0
16,160,600	Stk.	Aug. 14	4/17/4	Gas- 4 p.c. Ord.	105—106	..	4 11 10
2,600,000	"	"	3½	light 3½ p.c. max.	81—84	..	4 3 4
4,062,235	"	"	4	and 4 p.c. Con. Pref.	99—101	+1	3 19 3
4,531,705	"	June 14	3	Coke 3 p.c. Con. Deb.	76—78	..	3 16 11
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	91—93	..	5 7 6
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	16½—17	..	6 9 5
131,000	Stk.	Sept. 13	7⅞	Ilford A and C	154—157	..	4 17 1
65,780	"	"	6½	Do. B	121—123	..	4 19 7
65,500	"	June 28	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
4,940,060	Stk.	May 15	9	Imperial Continental	181—184	..	4 17 10
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	86—88	..	3 19 7
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	122—125	..	4 16 0
561,000	Stk.	Aug. 29	10	Liverpool United A.	215—217	+3	4 12 2
718,100	"	"	7	Do. B.	155—157	+1	4 9 2
306,083	"	June 28	4	Do. Deb. Stk.	100—102	..	3 18 5
63,480	Stk.	June 28	3	Maidstone 3 p.c. Deb.	66—68	..	4 8 3
75,000	5	June 14	6	Malta & Mediterranean	4⅜—4⅝	..	6 3 1
250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	99—101*	+¼	4 9 1
541,920	20	May 31	3½	Monte Video, Ltd.	11—11½	..	6 1 9
1,775,892	Stk.	July 26	4⅜	Newc'tle&G'tesh'd Con.	98¾—99	..	4 8 5
529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	84⅜—85½	..	4 2 1
55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13½—14⅜	..	5 1 4
300,000	Stk.	May 15	8	Oriental, Ltd.	134—136	..	5 17 8
60,000	5	Sept. 27	10	Ottoman, Ltd.	8⅛—8⅜*	+⅛	5 14 3
60,000	50	Aug. 14	13	Portsea Island B	127—130	..	5 0 0
100,000	50	"	12	Do. C	124—127	..	4 14 6
398,490	5	May 15	8	Primitiva Ord.	6⅞—7⅛	—⅛	5 12 3
796,980	5	June 28	5	Do. 5 p.c. Pref.	5⅛—5⅝	..	4 12 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
312,650	Stk.	June 28	4	River Plate 4 p.c. Deb.	93—95	..	4 4 3
275,000	5	Apl. 12	12	San Paulo, Ltd.	13—14	—⅛	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11⅛—12*	..	5 0 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Aug. 29	10	Sheffield A	229—231	..	4 6 7
209,984	"	"	10	Do. B	229—231	..	4 6 7
523,500	"	"	10	Do. C	229—231	..	4 6 7
90,000	10	Sept. 27	7½	South African	9—10*	+⅛	7 10 0
6,429,895	Stk.	Aug. 29	5/9/4	South Met., 4 p.c. Ord.	116—118	..	4 12 8
1,895,445	"	July 12	3	Do. 3 p.c. Deb.	76—79	..	3 15 11
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	162—164	+7	5 3 8
605,000	Stk.	Aug. 14	5/16/8	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 16 3
60,000	"	"	5	Do. 5 p.c. Pref.	116—118	..	4 4 9
117,058	"	July 12	5	Do. 5 p.c. Deb. Stk.	120—122	..	4 2 0
502,310	Stk.	May 15	5	Southampton Ord.	105—107	..	4 13 6
120,000	Stk.	Aug. 14	7½	Tottenham A 5 p.c.	142—145	..	5 0 0
483,940	"	"	5⅝	and B 3½ p.c.	114—116	..	4 19 2
149,470	"	June 28	4	Edmonton 4 p.c. Deb.	94—96	..	4 3 4
182,380	10	June 15	5	Tuscan, Ltd.	8⅛—8⅝	..	5 15 11
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97—99	..	5 1 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	114—115	+1½	4 6 11
255,636	Stk.	Aug. 29	6⅞	Wands- B 3½ p.c.	133—141	..	4 17 6
85,766	"	June 28	3	worth 3 p.c. Deb. Stk.	70—72	..	4 3 4

Prices Marked * are "Ex. Div."

The Bradford Gas-Engine Company has been registered, with a capital of £4000 in £1 shares—1000 being preference shares.

The Directors of the Primitiva Gas Company of Buenos Aires, Limited, have declared an interim dividend for the half year ended June 30, at the rate of 3s. 6d. per share—the same as last year.

The Amesbury and District Water Company, Limited, has been registered with a capital of £2500, in £1 shares, for the purpose indicated in the title, and to adopt an agreement with Colonel Sir Edmund Antrobus, Bart.

While a gas-fitter was attending to an escape of gas in a Birmingham house, a maid applied a light to the stove in an adjoining kitchen, and caused an explosion at the point where the man was working. He was badly injured and the room set on fire.

Important mains extensions have been sanctioned by the West Bromwich Town Council; and the tenders of Messrs. John Aird and Co., Limited, and the Stanton Iron-Works Company have been accepted for the work. The contracts for the supply of 29,900 tons of coal have been entered into.

Messrs. John Wright and Co., of Birmingham, forward copies of their new winter season's literature. There are three attractive little pamphlets dealing with the firm's many patterns of gas-stoves and radiators; and one of them, entitled "Gas-Grates instead of Gas-Stoves," may be specially mentioned. This contains excellently prepared illustrations of built-in and dog gas-grates of beautiful design. The booklet should prove a great temptation to any present or prospective gas consumer in whose hands it may be placed.

In an official report on the recent fire at the electricity generating station of the Islington Borough Council, which deprived a large portion of the borough of light for a considerable period, the Lighting Committee state that "the switchgear was quite new, and only just completed; and fortunately the high-tension switches and apparatus, which are enclosed in stone cubicles in a fireproof room, were not damaged in any way. The whole of the system was quite up-to-date, and specially designed and erected with the object of minimizing fire risks. The damage caused by the fire was confined to one-half of the operating switchboard and the instruments, &c., connected therewith, and is covered by insurance."

WANTED, SALE, FOR CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. Sittingbourne Gas Company. Applications by Oct. 14.
REPRESENTATIVE. No. 5637.
ASSISTANT STOREKEEPER. No. 5638.
WORKS CHEMIST. No. 5636.
MACHINE MEN AND ASSISTANTS (FIDDES-ALDRIDGE). Ormskirk Gaslight Company.

Appointments, &c., Wanted.

LEADBURNER, &c. Masonic, 118, Galloway Road, Shepherd's Bush.

Gas-Works for Sale.

KETTON GAS-WORKS. J. H. Silcox, Park View, Swansea.

Plant, &c. (Second-Hand), for Sale.

LAMP COLUMNS AND LANTERNS. Barnsley Gas Company.
SCRUBBER-WASHER, &c. Redditch Gas-Works.

Plant (Second Hand) Wanted.

EXHAUSTER. Ormskirk Gaslight Company.

Fellowship and Scholarship.

LEEDS UNIVERSITY (Coal Gas and Fuel Industries Research Fellowship).
INSTITUTION OF CIVIL ENGINEERS (William Lindley Bequest Scholarship).

Licensees Wanted.

"ST. MUNGO" GAS FIRE. Mr. P. Fyfe, 23, Montrose Street, Glasgow.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. By Auction. London Mart. Oct. 22.
BEXHILL WATER AND GAS COMPANY. Tenders by Oct. 16.
BOGNOR GASLIGHT COMPANY. By Auction. London Mart. Oct. 22.
GREAT YARMOUTH WATER-WORKS COMPANY. By Auction. London Mart. Oct. 22.
HERNE BAY GAS COMPANY. By Auction. London Mart. Oct. 22.

Stocks and Shares *(continued)*.

SEVENOAKS WATER WORKS COMPANY. By Tender. Oct. 26.
SOUTH SUBURBAN GAS COMPANY. By Auction. London Mart. Oct. 22.
SOUTHEND GAS COMPANY. By Auction. London Mart. Oct. 22.

TENDERS FOR

Coal and Cannel.

SMETHWICK GAS DEPARTMENT. Tenders by Oct. 22.

Sulphuric Acid.

LEICESTER GAS DEPARTMENT. Tenders by Oct. 12.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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